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The Dandelion

Examining Your Environment



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The Dandelion



Examining Your Environment

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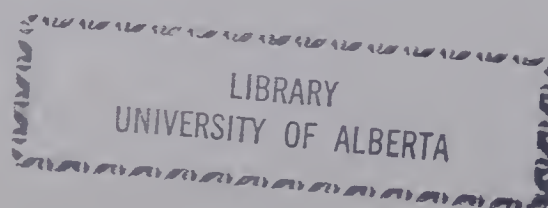
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Concern for the world in which we live, and actively studying the out-of-doors are important and growing parts of the school program. To some people, outdoor studies may mean that elaborate field trips to distant places are important. Others may feel that the world immediately outside the walls of their school has little to offer in the study of *environment*.

How wrong they are! In *The Dandelion* you will find how this lowly, common plant can be used as a starting point to develop a real understanding of ecology (the study of how plants and animals relate to each other and to the world around them). You will find how the dandelion influences the small world in which it is found and, in turn, how it is influenced by that world. The large numbers of dandelions provide opportunities to develop skills in finding out how many plants are growing in different areas (plant population study). The unusual adaptations that enable the dandelion to survive when other plants die are examined. Experiences are provided that will set the stage to enable you to study other plants more purposefully, to understand the inter-relationships of living things in the world at large, and to better appreciate the importance of even a single plant in our environment.

It is not necessary to have beforehand a great knowledge of dandelions in order to do the *Activities* in this book. Nor do you need to have available a large number of reference books

to assist you in finding answers. In fact, the answers to many of the problems can only be obtained by carrying out the activities. If you do the activities carefully you will gather first-hand information about the dandelion.

Try to work in groups. Before you start, plan carefully the jobs to be done, the equipment needed, and the responsibility of each group member. Be certain to consider the way in which the data or information that you collect will be recorded. It may be necessary to prepare data sheets before you start the activity. Many activities should be repeated, and the evidence obtained should be averaged.

Do not feel that you must do all the activities in this book. If one topic or chapter particularly interests you, you may wish to study it in greater depth and omit the other topics. As you work on the problems, you may discover others that you want to investigate. Your problems may be much more intriguing than those suggested by the authors. Do not be afraid to investigate them.

After each problem is found a *Digging Deeper* section. This is designed to guide you towards a better understanding of the activity that you have completed, and to assist you in interpreting the data that you have collected.

The *Branching Out* suggestions provide starting points for investigations related to the problem that you have explored. You may find it interesting to pursue your own in-depth study of some of them.



1. The Touch Of Spring

As the long dreary winter season comes to an end, most of us look forward happily to the signs of emerging spring. One of the more bright and cheerful signs of spring is the appearance of yellow dandelion flowers. Although these vivid golden splashes of color may bring groans to the lips of eager gardeners, they nevertheless hold forth to us the promise of warm, sunny days ahead.

When the dandelion flowers first appear in large numbers, some interesting discoveries can be made. Some simple observations and activities will help you to better understand how even small differences in temperature, sunlight, moisture, and soil can noticeably affect the growth of plants. Usually, when we speak of *climate*, we think of the weather conditions over a large area for a long period of time. In these studies, we shall consider the weather and living conditions in a small area extending from a few metres above the earth's surface to a few centimetres below it. Because the area that is being studied is so small, we call the climate in this area a *micro-climate* or *mini-climate*. It is most important that these activities be done within about a two-week period when dandelion flowers first appear. Shortly after this time, these flowers are so numerous that it is hard to detect the effect that small differences in the mini-climate have on the numbers of dandelion flowers.



Dandelion flowers can be found growing near buildings...



...on sloping ground



...in sheltered areas.



What conditions might account for the great number of dandelion flowers in this area?

Activity 1:

In what locations do most dandelion flowers first appear?

PART A

When dandelion flowers first appear in large numbers early in the year, walk around your schoolyard, a near-by park, and your neighbourhood, to observe where the dandelion flowers are most abundant. Look particularly at areas close to buildings and on sloping ground surfaces.

Note conditions that you think might account for the greater number of dandelion flowers in some areas. These conditions could include the number of hours of sunlight which the area receives; the direction in which the area faces; whether the area is level or sloping; if the area is protected from wind; objects such as buildings, plants, and driveways that are nearby. What other conditions might affect the number of dandelion flowers in these areas?

Record your findings on a chart like the one illustrated. Compare your information with that of other students.

Areas where Dandelion Flowers are Most Abundant	
Location	Description of the Area
1. Beside the wall of the school building.	The wall faces east and the area is protected from wind by shrubs and trees.
2.	

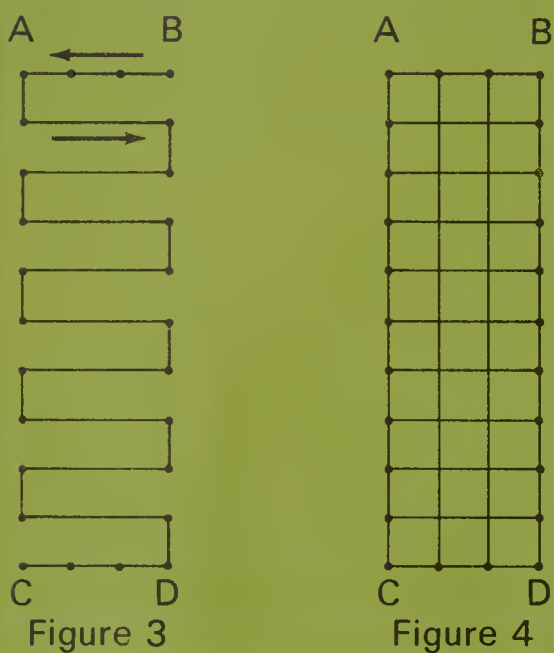
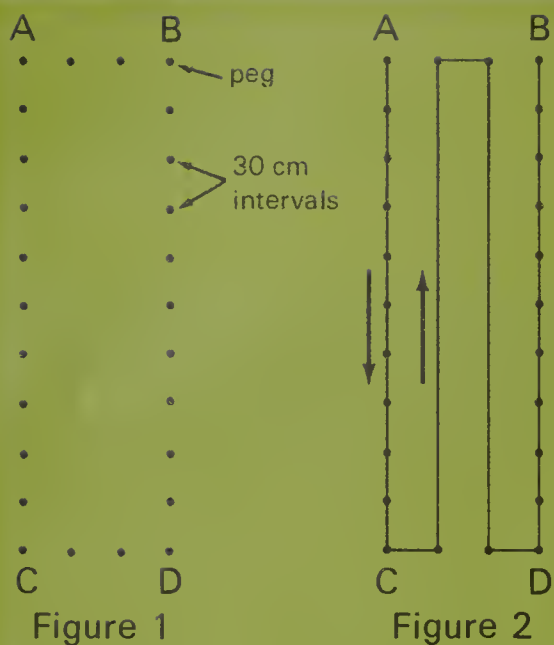
PART B

Prepare a map of one of the areas that you have recorded. The area being mapped should be about 90 cm wide and long enough to extend from a place where dandelion flowers are very abundant to where there are very few or none at all.

Divide the area into 30 cm squares using pegs and string. Materials that can be used as pegs are popsicle sticks, wooden tongue depressors, pencils, or nails at least 10 cm long.

Drive a peg into the ground at point A. From this point measure to point C with a measuring tape. If the measuring tape is left lying on the ground, other pegs can be driven in to mark 30 cm intervals.

Use a metrestick to measure from point A to point B. Drive a peg into the ground at point B and at 30 cm intervals between points A and B. The remainder of the area can now be pegged using the measuring tape and metrestick. (See Figure 1.)



Students are measuring an area where dandelion flowers are numerous. The length of the area being measured is from 3m to 6m long.



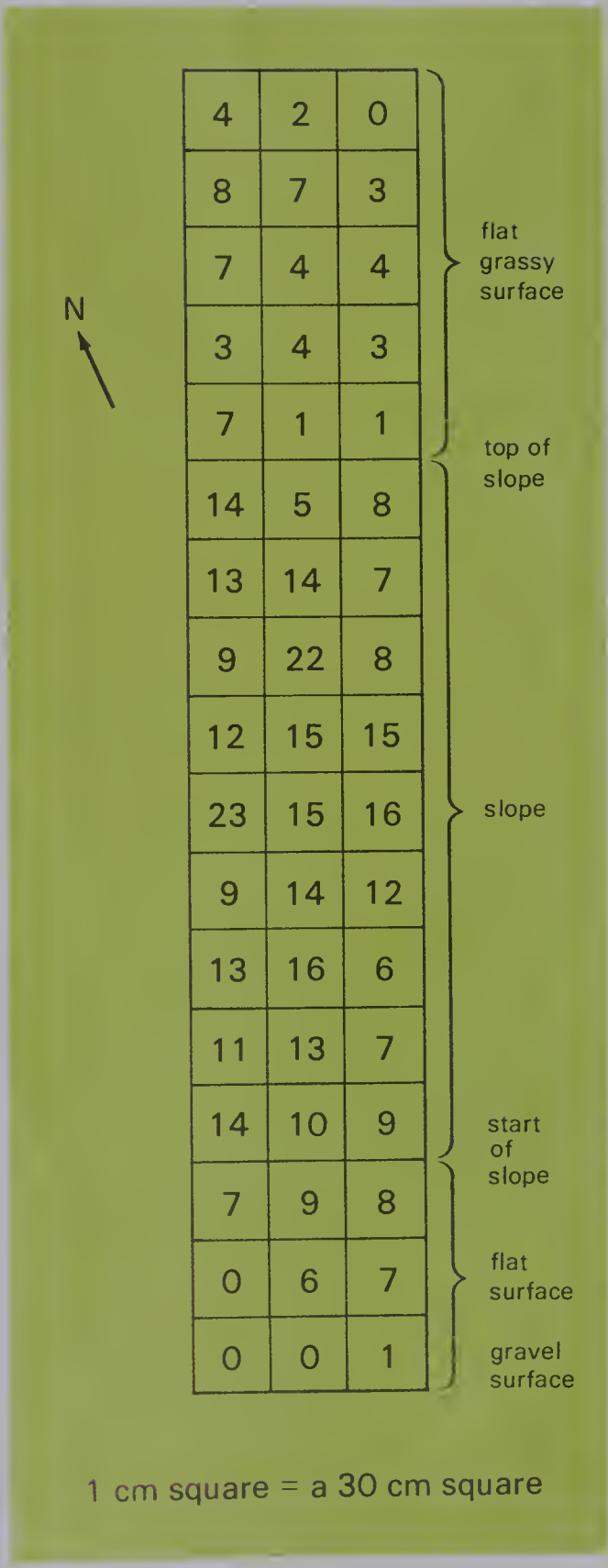
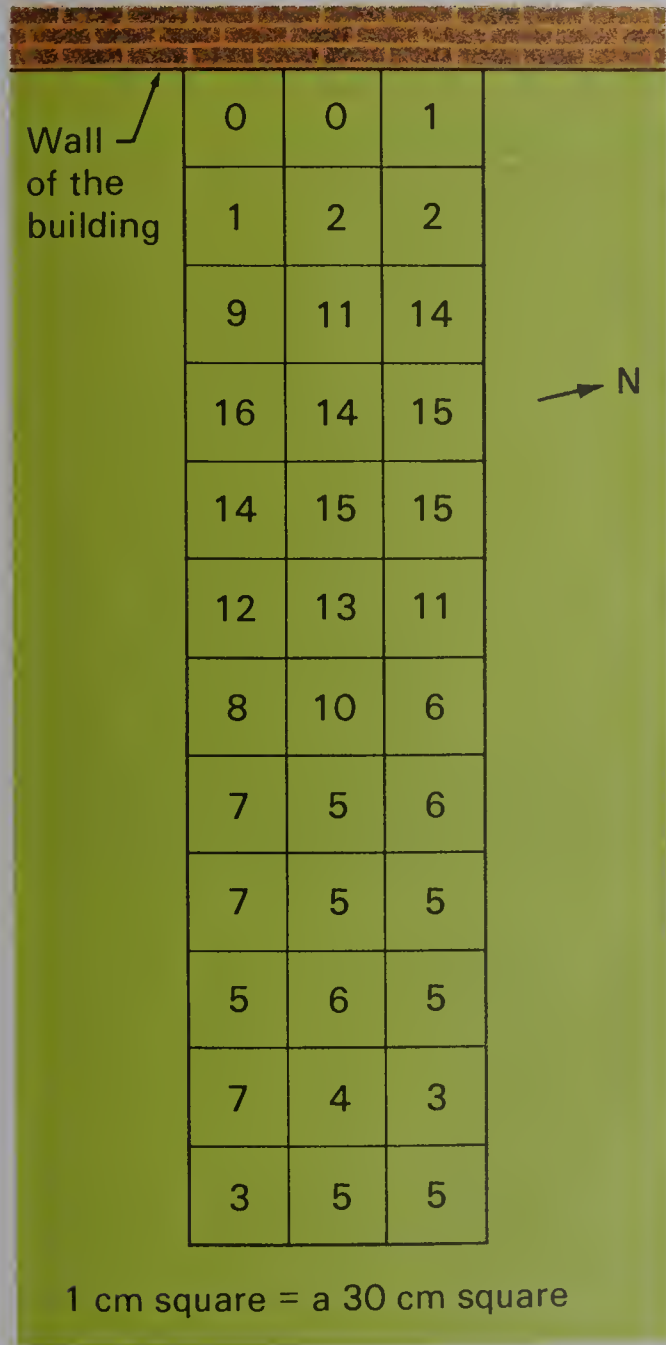
Tie a string to the peg at point A and run it along the surface of the ground as shown in Figure 2. Tie it to the peg at point B.

Tie another string to the peg at point B and run it along the surface of the ground as shown in Figure 3. Tie it to the peg at point C.

Figure 4 shows the area completely divided into 30 cm squares.

Obtain a piece of paper and on it mark off an area into squares 1 cm to a side so that each square on this map can represent one square of ground.

The area that is marked off should therefore be 3 cm wide and as many centimetres long as there are 30 cm squares in the length.
 Count the number of dandelion flowers in each 30 cm square and record the number on the proper square on the map.



Completed records of dandelion flowers near the wall of a building and on a south-facing slope.

Each student is counting the dandelion flowers in some of the squares. All the information will be transferred to one map when they have completed counting the flowers.

Digging Deeper

Did each of the areas that had a large number of dandelion flowers receive a considerable amount of direct sunlight or were they usually in shade?

Were dandelion flowers more numerous close to a building or farther away?

On which side of a building were most dandelion flowers found?

In which direction was the sloping ground with many dandelion flowers facing?

Was there a fairly even spread of dandelion flowers over each area that was observed?

Was there a fairly even spread of dandelion plants over each area that was observed?

Why do you think that the dandelion flowers were more numerous in the places that you observed?

Branching Out

As time passes, note the new areas that become more densely covered with dandelion flowers. How would you explain the shift in dandelion flower population?

Observe the patterns made on the lawn of a park by dandelion flowers when they first appear in large numbers. In some places, the dandelion flowers are very abundant and in others they are quite scarce. Can you detect those areas that receive more sunlight and those that are more shaded by the trees?



How can the areas receiving more sun or more shade be recognized, even if the sun is not shining?

Many types of thermometers can be used to measure the temperature of the ground surface.

Activity 2:

What is the temperature at the ground surface in an area where the dandelion flowers are abundant?

Select one of the areas that you mapped in the preceding activity.

Obtain a number of thermometers and mailing tubes. The mailing tubes should be wrapped in tinfoil.

The thermometers should be standardized so that meaningful temperature readings can be taken.

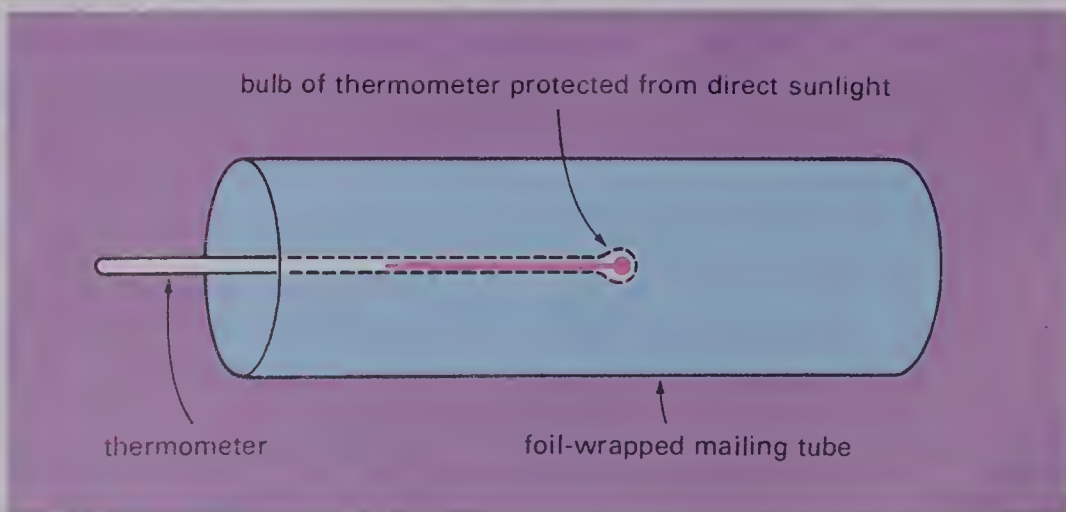
HOW TO STANDARDIZE THERMOMETERS

1. Place on a table with the *scale* side up all the thermometers that are to be used in this activity.
2. After about 5 min., when the liquid in the thermometers has stopped moving, note the temperature reading of each thermometer.
3. Most of the readings will likely be the same. Some may be higher or lower than the others. On those that are higher, place a piece of masking tape showing -1 , -2 , etc., to indicate the number of degrees that must be subtracted to have the thermometers read the same as the others. On those that show lower readings, place a piece of masking tape showing $+1$, $+2$, etc., to indicate the number of degrees that must be added to have those thermometers read the same as the others.

Place one thermometer in each foil-wrapped mailing tube so that the thermometer bulb will be shielded from the direct rays of the sun.



If long glass immersion-thermometers like those in the photo can be obtained, the results may be more accurate.



The number of dandelion flowers has already been counted. The air temperature at the ground surface is now being measured.

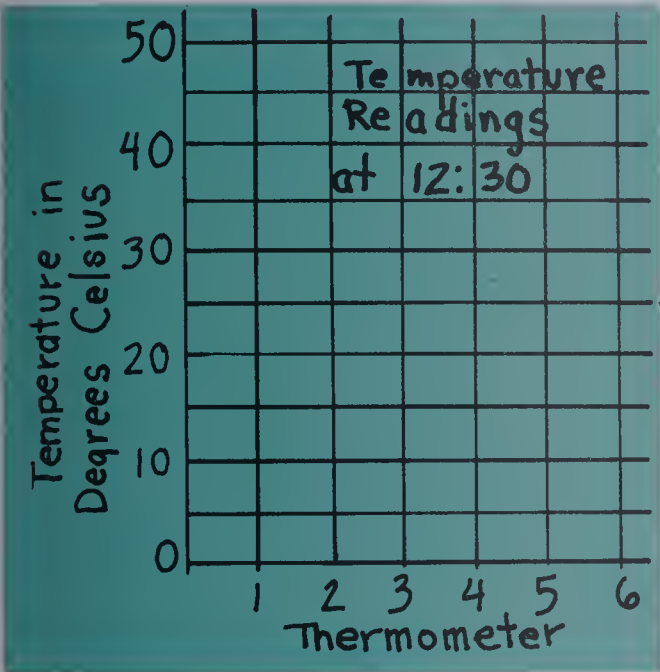
Place the tubes containing the thermometers on the ground 60 cm apart, and in a straight line through the area which you have selected. Be certain to include sections with many dandelion flowers and others with few flowers. Number the thermometers.

On a day when the sun is shining brightly, read the temperature of each thermometer at one-hour intervals starting at 08:30. The following guidelines will provide greater accuracy of thermometer readings.



1. Read the temperature as quickly as possible after the thermometer has been removed from the mailing tube. Better still, you may find that you can read the temperature without removing the thermometer bulb from the tube.
2. Do not permit the direct sunlight to fall on the thermometer bulb.
3. Do not hold the thermometer by the bulb while you are reading the temperature.

Prepare a chart like the one shown and record the temperature readings. Show on a line graph the temperature readings for each thermometer at 12:30.



Digging Deeper

What was the highest temperature recorded for the day? Which thermometer showed the highest temperature? Which thermometer had the highest average temperature for the day? What connection did you discover between temperature readings and the abundance of dandelion flowers? How would you explain the differences in temperature readings that you discovered? Compare your results with those of other groups of students in your class who examined different areas. Were their findings similar to yours? If the

Temperature Readings in an Area with many Dandelion Flowers						
Date: May 20	Thermometers					
	#1	#2	#3	#4	#5	#6
08:30						
09:30						
10:30						
11:30						
12:30						
13:30						
14:30						
15:30						
16:30						
17:30						
Average						

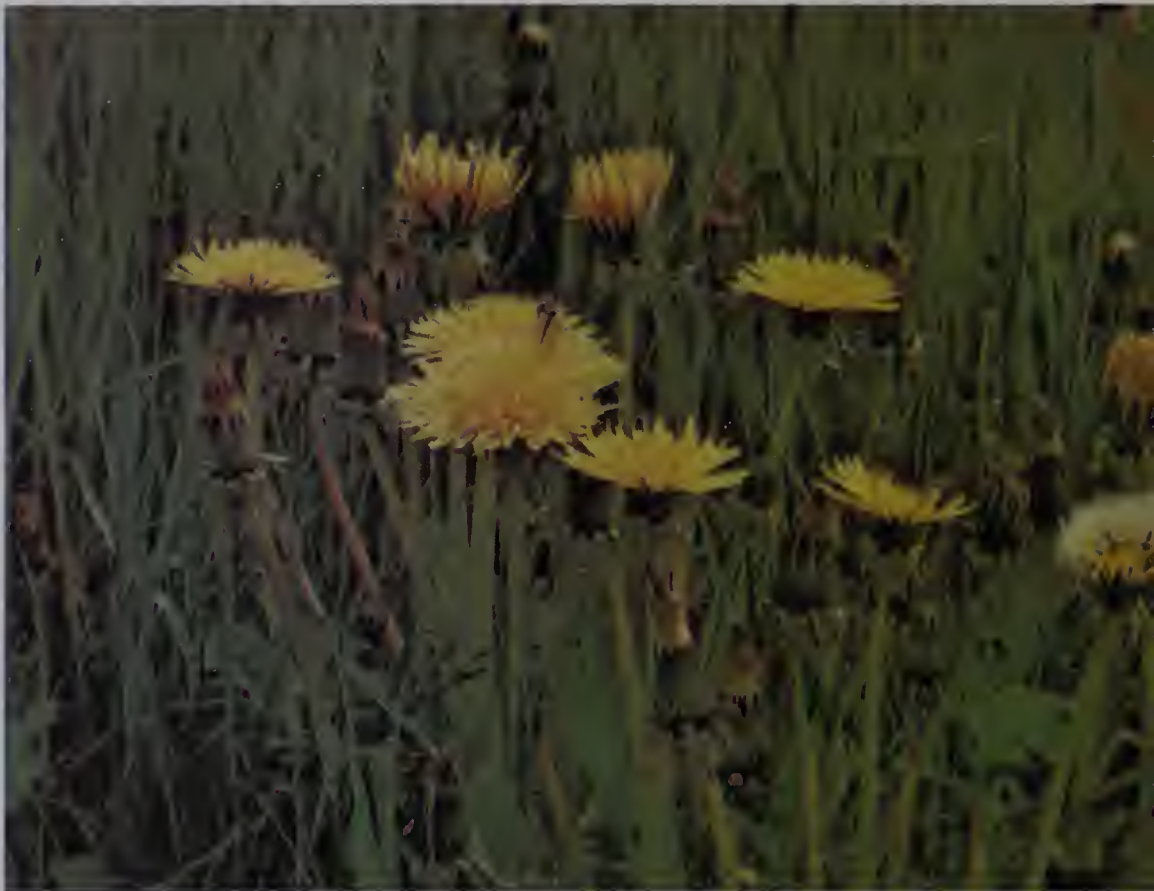
activity were repeated on another sunny day, would you get the same results? Why were the thermometers placed in foil-wrapped mailing tubes? Why was it necessary to use standardized thermometers? This activity could be called a controlled experiment. In a controlled experiment, it is necessary to identify as many of the variables as possible. A variable is something that is capable of being changed. In this activity, we were particularly concerned with finding out by how much the temperature varied at different places in the area at 12:30. To arrive at an accurate answer, all but one of the other variables had to be controlled or kept the same. Some of the variables that were controlled were time, standardized thermometers, and method of reading the thermometer. Can you think of others?

The only variable that changed was the location of the thermometer. If the experiment were properly performed, differences in temperature readings could be attributed to the differences in thermometer location. If all the thermometers had the same temperature at 12:30, what guess could you make about a connection between the number of dandelion flowers and the temperature?

Branching Out

What other conditions might have affected the abundance of dandelion flowers in the area that you studied? Perhaps possibilities such as the amount of moisture in the soil, the type of soil, the compaction of the soil, the fertility of the soil, and the force of the wind come to your mind. Can you plan and carry out a controlled experiment to test one or more of these possible conditions?

Select an area about 1.5 m wide and 3 m long extending from a south, east, or west wall of your school. Record at weekly intervals your observations about changes in plant and animal life, temperature, moisture, and soil conditions. Compare these observations with those obtained from observing a similar area extending from the north wall of the school.





2. Becoming Acquainted

Before getting too involved in the study of the dandelion, you should become better acquainted with the different parts of a dandelion plant. These different parts such as flowers, leaves, roots, and seeds make up the structure of the dandelion plant. Although it is so common, it would be a mistake to assume that there is nothing worthwhile to learn about the structure of the dandelion.

The dandelion flower is quite different from flowers such as the petunia or snapdragon. These flowers have only a single bloom. The flower of the dandelion is like that of the daisy, zinnia, and sunflower in which the flower is really a cluster of flowers or *florets* called a *head*. These flowers belong to a family called *composites*. Each tiny ray flower in a dandelion head produces a little one-seeded fruit or *akene* which will leave the head on a parachute.

The dandelion has some rather unusual characteristics of flower stem, leaf, and root. It is one of the few common plants that has no stem for its leaves. All of us are aware of the persistence of the dandelion. A study of the parts of the dandelion will better enable you to understand why the dandelion can survive so successfully.

The dandelion plant is often called a *weed*. A weed is a plant growing in a place where we wish something else to grow. It is possible, therefore, for a plant to be a weed in some locations and not in others. Some people say that a weed is any plant

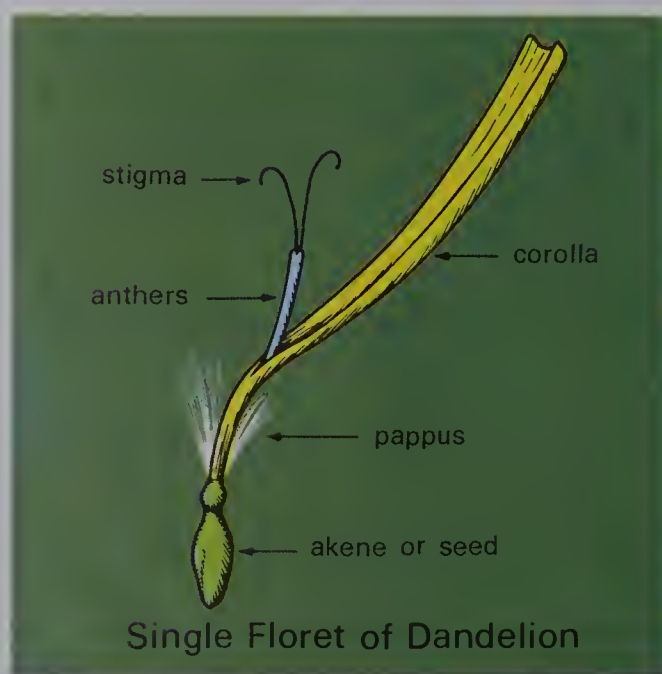
that is a nuisance. Do you think that the dandelion is a weed? Discuss the meaning of the word 'weed' with your parents, friends, and neighbours. Ask them if they think that the dandelion is a weed. After you have completed Chapter 6, the last chapter in this book, see if you have changed your mind about whether or not the dandelion is a weed.

Activity 1:

What are the parts of the dandelion flower-head?

A hand lens will help you to see the flower parts better.

Carefully remove one floret from a blooming dandelion flower-head. With the help of your hand lens, observe the floret and find each of the parts shown in the diagram. Draw the floret that you observed. Match your drawing with the diagram in the book and label each part of the floret.



These students are using a variety of hand lenses or magnifying glasses. In this study, which would be better, a magnification of 10 or 4?



A dandelion floret.



How does the color of the florets at the edge of the flower-head compare with the color of those in the middle?

A *corolla* is the whole group of petals of a flower. Examine the upper edge of the dandelion corolla. How many points can you find? Each point represents a petal. How many petals are there in each floret corolla?

Find the meaning of a *ray flower* in the glossary. Why are these flowers called ray flowers?

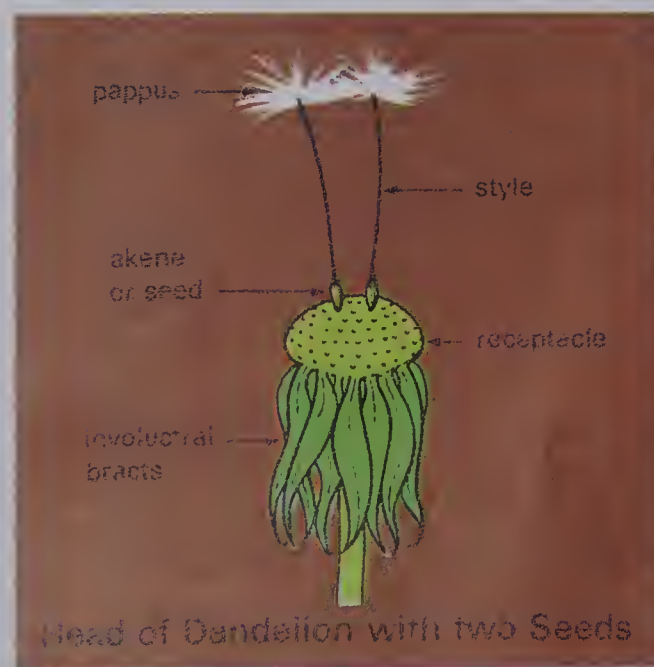
Is the *pappus* attached to the akene or above it?

Run your finger across the flower-head. Examine the dust (*pollen*) under a

hand lens or microscope. What is the color and shape of each pollen grain? On what part of the floret are most of the pollen grains found?

How many ray flowers are there in the dandelion flower-head that you are studying? Pull out all the florets and describe the appearance of the flower-head.

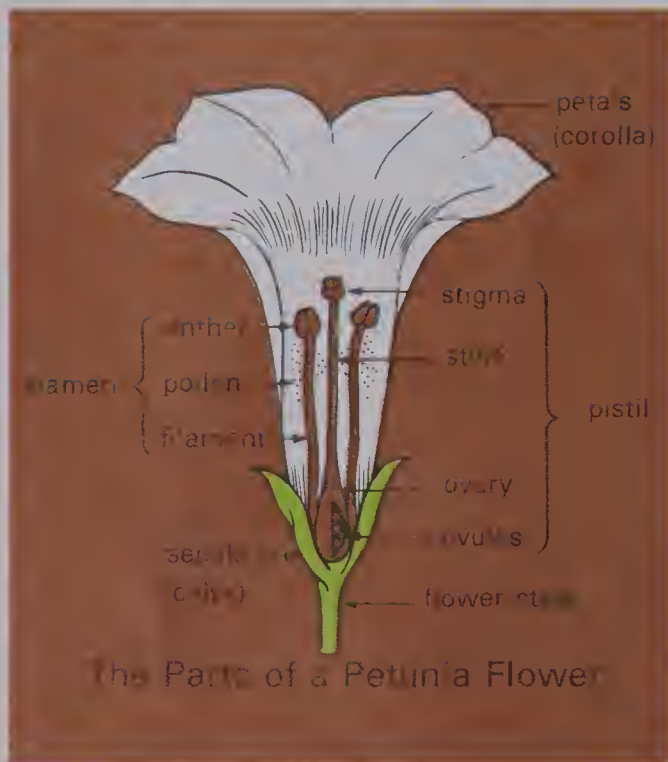
The flower-head is protected before it opens by *bracts* which act like green shutters. These bracts are called the *involucral bracts*. How many are there? How do the involucral bracts differ from the second set of bracts found closer to the flower stem? What happens to the involucral bracts as the flower-head opens? Describe the position and appearance of the involucral bracts on a flower-head from which all of the ripe seeds have been scattered or dispersed. Compare these with the involucral bracts on a flower-head that is closed.



Compare the dandelion floret with the seed. What changes took place in the floret when the seed ripened?

Branching Out

The petunia flower is a simple flower consisting of a single bloom. Obtain a petunia flower and compare it with the dandelion floret. What are the most noticeable differences between a simple flower and a dandelion floret?



Compare the flower-head of the zinnia with the flower-head of the dandelion. How are the florets at the center of the zinnia different from the ray florets of the dandelion?

Why is the name *disk flower* appropriate for the florets at the center of the zinnia? How do the zinnia and the dandelion ray florets differ?



The zinnia and the dandelion—composite flowers with a difference.

How many days have passed since this flower-head started to bloom?



Observe a dandelion flower-head that is just opening. Which florets open first? How many of the florets blossom during the first day? How many blossom during the second day? How long does it take before all the florets in the flower-head are in blossom?

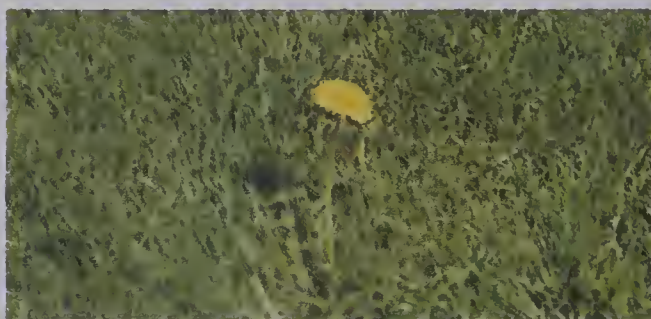
Does the dandelion blossom open on rainy or dark days? Do you think that this action has anything to do with the insect visitors? Do bees and other insects gather nectar during dark or rainy days?

Activity 2:

What interesting observations can be made of changes in the dandelion flower-head during the time that it is in bloom?

For this activity, it will be necessary to locate a number of dandelion flowers that can be easily observed several times a day, over a period of several days.

Observe at regular intervals during the day one dandelion plant that is in bloom. At what time is the flower-head open fully on a sunny morning? At what time did it start to open? How long does it take to open? How long does it remain fully open? At what time does the flower-head start to close? How long does it take to completely close?



The same flower.



Morning.

Noon.



Night.

Does the flower-head remain open longer in the afternoon on some days than on others even though the days are equally sunny?

Observe the dandelion flower stem in the morning just before and after the flower-head opens. How has it changed? How does this change affect the amount of sunlight that will shine on the flower-head?

Note that within a few days after all the florets have blossomed, the flower-head will remain closed a number of days. Measure the length of the flower stem when this period begins. How long does the flower-head remain closed? Measure the length of the flower stem again when the flower-head opens. By how much did it grow while the flower-head was closed?

When the flower-head opens up again, describe the changes that have taken place in it. Some changes that you should notice are: color change, parts of the florets that appear to be missing, and changed appearance of some parts.

Why would it be useful to the dandelion for the flower stem to grow so much at this time?

Activity 3:

How does the dandelion flower stem differ from the flower stem of other plants?

What unique qualities does the dandelion flower stem have?

Pick ten or more dandelion flower stems, some from your lawn, some from a field, and others from a variety of other places. Try to get the entire flower stem by removing each one as close to the ground as possible and by removing the flower-head as close to the tip of the flower stem as possible. Measure the length of these stems and the thickness at the bottom and at the top of each.

Compare the stem of the dandelion flower with the stems of other flowers from your garden.

Place your measurements of the flower stems on a chart to show differences in flower stem length.

Gather a bouquet of dandelion flowers and place them beside a bouquet of garden flowers.

Measuring the thickness of a dandelion flower stem with dividers.





Why do dandelions make a poor floral display?



Digging Deeper

How much longer was the longest flower stem than the shortest? Where were the shortest flower stems found? The longest?

How does the thickness of the bottom of the stem compare with the thickness of the top of the stem?

The dandelion stem is said to be tapered because it grows narrower toward one end. In a tapered object such as the dandelion stem, where is the greatest strength? How do you know that the stem is strongest at that point?

What things has man made in which he has used the idea of taper?

Is the dandelion flower stem hollow or solid?

How many other plants did you discover that had hollow stems? Try bending the flower stem of a number of plants. Does the dandelion flower stem break more easily than other flower stems do?



Can you describe the area from which these dandelion flower stems came?



What causes a fishing rod and car aerial to be particularly flexible?

Gather a number of dandelion leaves from the same plant and from other plants and examine them for similarities and differences.

Digging Deeper

In general, how are dandelion leaves alike?

Did you find any two dandelion leaves that were exactly alike?

Which leaves are longer, those from closer to the center of the plant or those from farther out? Which leaves are new leaves and which are old ones?

How do the leaves of young dandelion plants compare with the leaves of large, old dandelion plants?

How does the shape of a leaf taken from close to the center of the plant differ from the shape of a leaf taken from farther out?

Dandelion leaves—alike and yet different.

How long did your dandelion bouquet last before it wilted? How did this compare with the bouquet of garden flowers? Explain why you think one bouquet lasted longer than the other.

Activity 4:

How alike are dandelion leaves?

Dandelion leaves provide a fine study in variation. The edges of the leaves are notched in a rather unusual way. Someone supposed that the resulting lobes looked like a lion's teeth. The French name for the plant is *dent-de-lion* ("lion's tooth"). From this has come the English name, dandelion.





Why would it be difficult for other green plants to live under a dandelion plant?

How do these leaf arrangements differ from that of the dandelion plant?

Activity 5:

How are dandelion leaves arranged?

Dig up a dandelion plant and notice the way in which the leaves are arranged.

Pull off each of the leaves, starting with those at the bottom.

Digging Deeper

How would you describe the leaf arrangement of the dandelion?

How effective is this arrangement in assuring that the dandelion plant receives maximum sunlight?



Activity 6:

What kind of root does the dandelion have?

Carefully dig up a dandelion plant and a plantain plant so that the roots are intact. Compare the two roots.

The dandelion root is described as a tap root. The plantain has a fibrous root.

Explain why the dandelion is able to withstand drought.

Try to pull a dandelion plant and a plantain plant out of the ground. Which is easier to pull out?

Why is the dandelion difficult to remove once it has become established?

Break a piece from the dandelion root. Describe the juice that emerges. Is this juice found in other parts of the plant? Rub the juice between your fingers. How does it feel?

Did You Know?

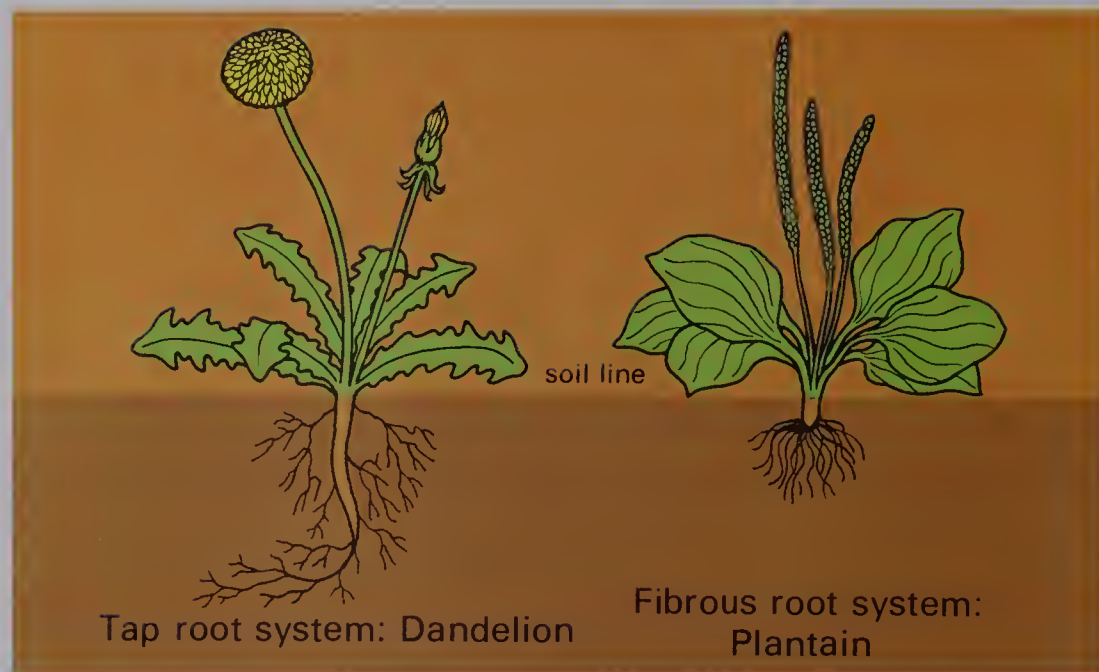
That the dandelion seeds can germinate (sprout) even after soaking in a salty ocean for 28 days.

That the vireo bird lines its nest with dandelion seeds.

That the dandelion is found all around the civilized world, even in parts of the Tropics.

That the dandelion is able to change its way of living according to where it lives.

That the Russian dandelion yields sufficient latex (milky juice) for it to be used as a source of rubber.



That the dandelion was valued for centuries as a medicinal plant.

That some other names for the dandelion are blowball, lion's tooth, cankerwort, milkgowan, witch-gowan, yellow-gowan, Irish daisy, monk's head, priest's crown, and arnica.

That the maximum height above sea level at which the dandelion is found is about 800 m.

That dandelion seeds have passed through the digestive tract of birds unharmed.

That dandelions have a milky juice that is given out when it is wounded and, like blood, congeals to form a protective scab.

That dandelions can reproduce from small portions. Even a small part of a dandelion root may, in time, produce a new dandelion plant.

That the dandelion plant does not have a stem.

That the dandelion has a vitamin A content 25 times that of tomato juice and 50 times that of asparagus.

That in some countries dandelions are grown as a cultivated crop.



3. *Dandelion Populations*

If you are particularly observant as you look around the schoolyard or local park, you will note that more dandelion plants seem to be growing in some areas than in others. Where are the plants most abundant? What might account for the greater number of dandelion plants in these areas? (Consider how the dandelion seed is dispersed.) Make a list of places where there is clear, visible evidence that there is a larger than usual concentration of dandelion plants. Did you find places such as those shown in the photographs?



What reasons can you suggest for the abundance of dandelion plants in these locations?

As you observed evidence of the differences in the number of dandelion plants in various areas, you may have become aware that dandelions were generally very common plants. Perhaps you asked yourself "How many dandelion plants are there on that lawn?"

Ecologists are scientists who study how plants and animals relate to each other and to their environment. One study that interests the ecologist is how many plants of a particular type are found in an area and how evenly spread the plant is throughout the area. This is a study of *plant population*. When a scientist examines a single plant, he can learn a great deal about it. However, there are some things about a plant that can be learned only when a great number of them are examined at one time. When ecologists study plant populations they ask the following questions:

How many plants of a particular kind or species are there in the area being studied?

How do the numbers change from time to time?

Why does the population change?

How is the population distributed or spread throughout the area?

How much surface or area is covered by the particular plant?

The large numbers usually make it impossible, and even useless, to count all the plants in an area. If you were to attempt to count all the dandelion

plants in a park or on a school lawn, you would spend a great amount of time and energy. It might take weeks. By the time you had finished, your information might not be accurate because many new plants might have sprung up. Instead of counting every plant, other methods, called *sampling techniques*, are used that can provide enough information about plant population. This means that instead of counting all the dandelion plants in a lawn we would count only those in some small sample areas in the lawn. When using a sampling technique to find how many dandelion plants are in a lawn, a number of small areas in the lawn (samples) are carefully selected. It is very difficult to select fair samples. You discovered earlier that dandelion plants are not evenly spread. To obtain samples that are as fair as possible follow these points.

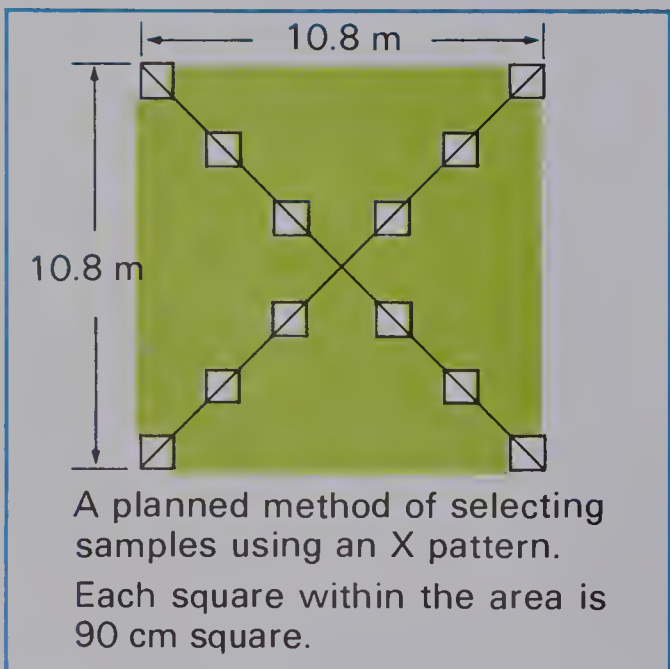
- (a) The samples that are selected should include some areas where many of the plants are growing and some where few are growing. You will not get an accurate population count if you select only sample areas that have a great many dandelion plants and ignore those areas where no dandelion plants are growing.
- (b) The samples should fairly represent the entire area. If you ignore some parts of the area because they are harder to work in, or for some other reason, you again will get inaccurate results.

The hula hoop should not be aimed at a particular spot and yet the place where it lands should fairly represent the entire area.

- (c) Quite obviously, if you select only 1 or 2 sample areas, you will obtain inaccurate information. Generally, the more samples that you use the better the results will be. The number of samples that you select should be reasonable for the area that you are studying.

In some situations, samples can be selected in a planned or systematic way. A field can be marked with string into a pattern such as an X, $+$, or Z. At regular intervals along the string, a 90 cm square area can be marked. Each of these 90 cm square areas is a sample area. All the dandelion plants in these sample areas are to be counted.

Find the dandelion population of part of your lawn using a planned pattern such as an X, $+$, or Z. Compare your results with students who have used a pattern different from yours.



Which of these three patterns do you think is the most accurate? the least accurate? (Note: The 90 cm square can easily be measured by using a *quadrat* frame—see the diagram.)

Instead of selecting the samples in a planned way, they may be selected at *random*. This means that there is a considerable amount of chance in the samples that are selected. The random samples are obtained by throwing a hula hoop or a quadrat frame back over your shoulder without actually aiming at a particular spot. It is necessary to first choose a place that appears to be average for the area. The samples really should be random, and yet each sample should fairly represent the part of the area being examined.

Construct a sturdy, square, wooden frame so that the inside length and width is 90 cm. This encloses an area 90 cm square.

Drill holes at 30 cm intervals so that the frame can be threaded with strong string to produce a pattern of small squares each 30 cm to a side.

In using the quadrat frame, plants can be counted within the entire frame or in one square of it.

Activity 1:

What is the dandelion population of the school lawn?

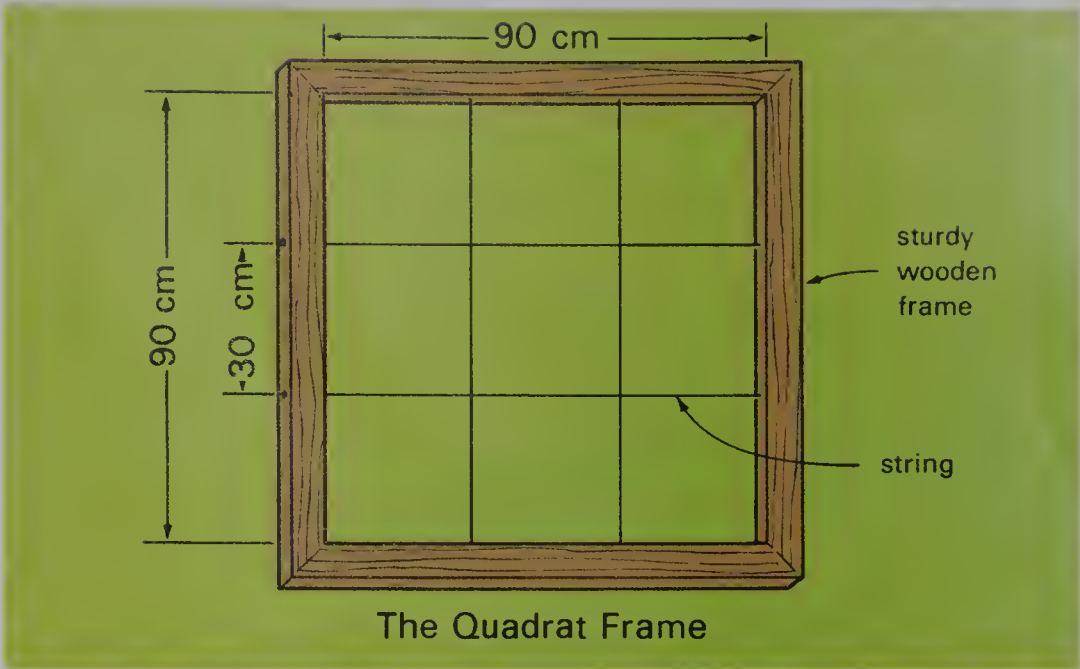
Construct a quadrat frame from the plans given.

Examine the entire school lawn to find good places for sampling.

Use the random sampling technique described earlier. Find 10 different places on the school lawn that appear to have an average number of dandelion plants. At each place, throw a quadrat frame back over your shoulder so that it lands somewhere on the lawn without having been deliberately aimed. Use care in throwing the quadrat frame so that it is not damaged.

Count the number of dandelion plants within the entire frame at each location. Where only a part of a plant is enclosed, count the plant if more than half of it is located within the frame.

Record your information on a chart like the one shown here.



Dandelion Population on the School Lawn Date _____	
Sample	Number of Dandelion Plants
1	3
2	0
3	10

Counting dandelion plants within a quadrat frame.



CALCULATING THE FREQUENCY OF DANDELION DISTRIBUTION

One kind of information that can be gathered from the sampling activity is the amount of lawn surface that has dandelions growing in it. This is called the *frequency*.

The frequency of the dandelion depends on the number of samples in which the dandelion was found. If dandelions were found in 7 of the 10 samples, we would say the frequency was $\frac{7}{10}$ or 7 out of 10. The sample is counted regardless of the number of dandelions that it contains, even if one sample has 14 dandelion plants and another has only one. We usually describe the frequency as a *percentage*. To obtain the percentage, simply multiply by 100,

$$\frac{7}{10} \times 100 = 70\% \text{ (percent).}$$

This means that dandelions are found scattered over 70 percent of the lawn. It does not mean that 70 percent of the lawn is covered with dandelions.

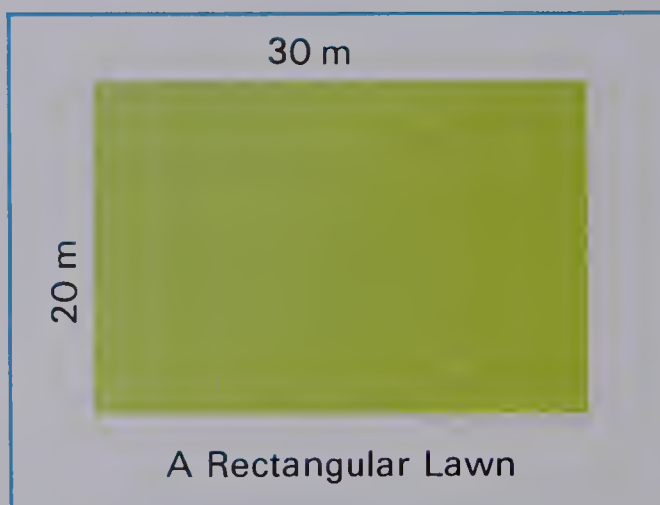
If the frequency of dandelion plants on your lawn is 100 percent, what does this mean?

CALCULATING THE NUMBER OF DANDELIONS

The quadrat frame enclosed an area 90 cm square. Total all the dandelion plants counted in the 10 samples. Divide this total by 10. This will show the average number of dandelion plants per 90 cm square of the lawn. For example, the total number of dandelion plants in 10 samples is 40;

therefore, the average number of dandelion plants in each 90 cm square is 40 divided by 10, equals 4. To find the number of dandelion plants in the entire lawn (the dandelion plant population), it is first necessary to find the number of square centimetres or square metres in the lawn or the area of the lawn.

Use a measuring tape to measure the length and width of the lawn in metres. (Most lawns are rectangular in shape.) Multiply the length and width to obtain the area of the lawn in square metres.



In this case the area would be 20 m times 30 m = 600 m². Multiply the total number of square metres by the average number of dandelion plants per square metre to find the dandelion population of the lawn. In this case, it would be 600 (number of square metres) times 4 (average number of dandelions per square metre) = 2400 (the dandelion population of the lawn).

How would you explain to another student the difference between the frequency of dandelion plants and the

dandelion plant population on your school lawn?

The number of dandelion plants per square metre tells us about the *density* of dandelion plants. This is also a very important piece of information. For example, if a lawn were only 15 m long and 10 m wide, it would have an area of $15\text{ m} \times 10\text{ m} = 150$ square metres. If the density were 20 dandelion plants per square metre, the population would be $150 \times 20 = 3000$ which is greater than for the larger lawn.

Digging Deeper

What was the frequency of dandelions in your investigation?

How many dandelions did you calculate were found in your school lawn?

How would the results for frequency and population compare if you used 100 samples instead of 10? Which answers would be more accurate? Why?

Compare your results with those obtained by other students in your class.

What is the dandelion population in other areas such as your lawn at home or a nearby park?

In what area is the dandelion population most dense? How would you explain this?

Branching Out

Compare the population of dandelions on the school lawn with the populations of 5 or 6 other plants found

on the school lawn. If you cannot identify the other plants, you can simply label them plant 1, plant 2, etc.

Find the dandelion population on your school lawn at different times of the year and compare the results.

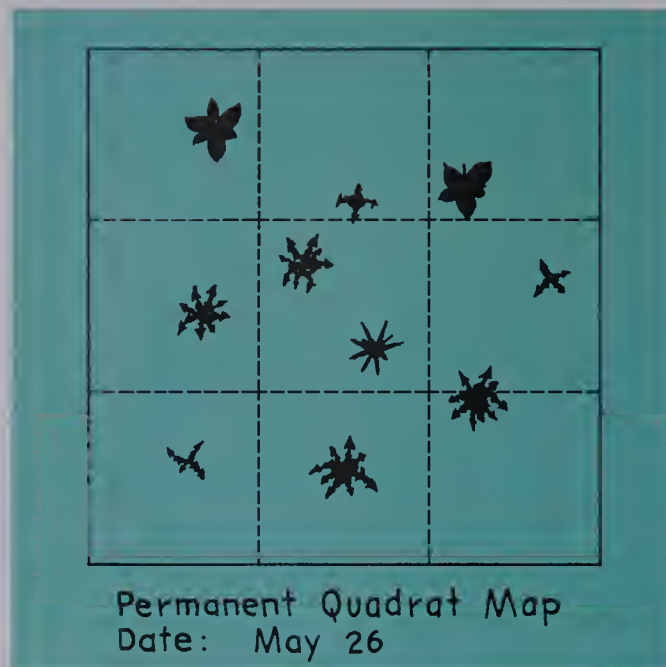
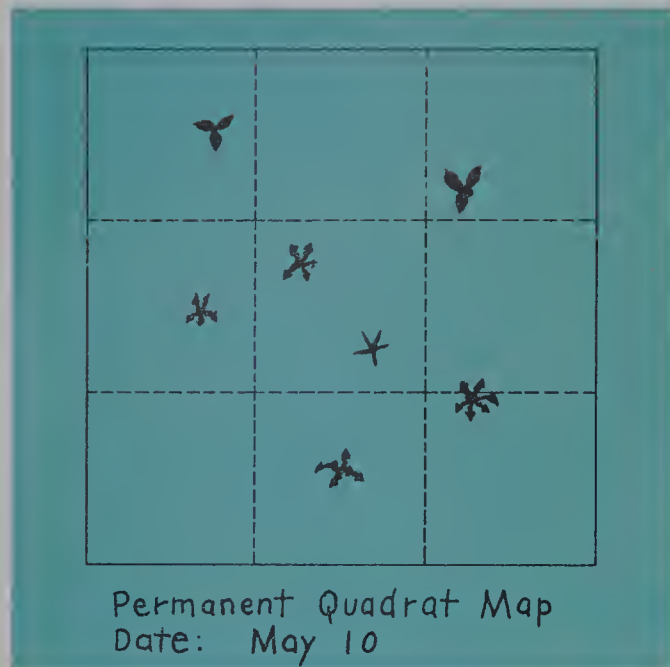
Activity 2:

What changes take place in the dandelion population over a period of time?

During the year, many changes can take place on your lawn at home. Fertilizers and weed killers are often applied. The moist, mild weather of spring turns hot and dry in summer. Some people water their lawns. Dandelions go to seed and produce new plants. The dandelion population can change considerably over a period of time.

On your lawn, select an area 90 cm square that contains some dandelion plants. This area can be located by placing the quadrat frame on the lawn and driving a small stake into the ground at each corner. This area can become a permanent quadrat. Use the stakes to replace the quadrat frame on the permanent quadrat each time that you wish to sample this area. Care should be taken in selecting an area where the stakes are not likely to be disturbed. disturbed.

At regular intervals of several weeks, examine the permanent quadrat and draw a map to show the changes that have taken place.



What change took place in the number and size of dandelion plants?

Digging Deeper

What change took place in the number of dandelion plants?

What change took place in the size of the dandelion plants?

Did any change take place in the number and size of other plants?

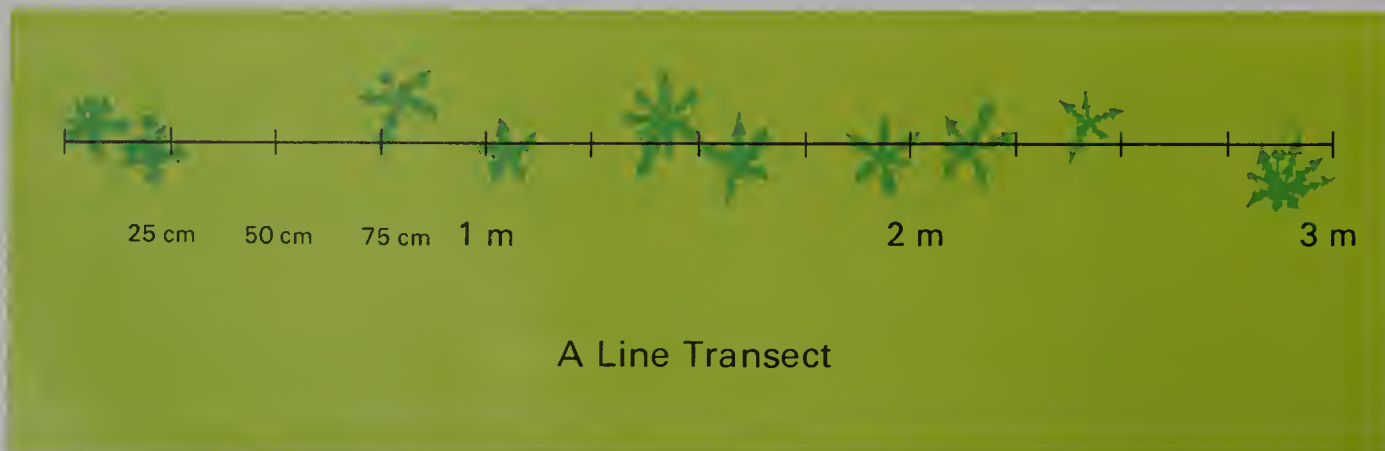
Branching Out

Early in the spring, prepare a clear area, 90 cm square in your garden. At regular intervals, map the changes that take place in plant population and plant size.

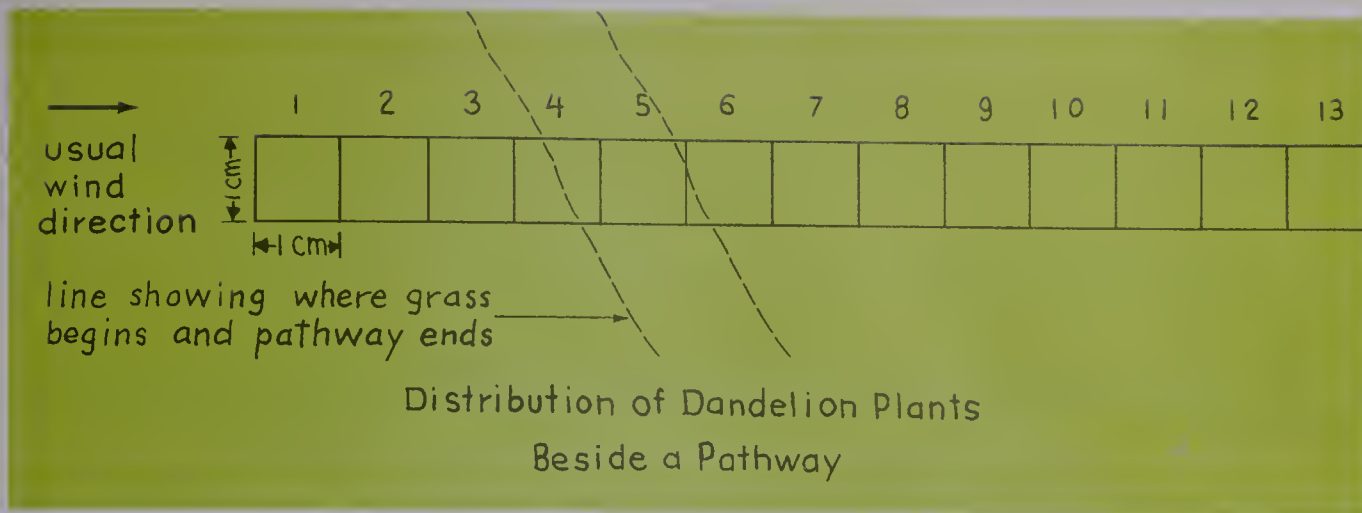
Earlier in this chapter, you observed that dandelion plants were not evenly spread over an area. You may notice

that there is a very obvious change in the number of dandelion plants from one place to another. In such a case, make a study along a line transect or a belt transect to determine just how much the dandelion population changes.

A line transect and a belt transect are very similar. When using a line transect, a straight line is marked on the ground with string. The line should cut across the area to be studied and care should be taken to have the line include those points where changes in plant population are evident. All the plants that touch or cover the line are noted and the area covered by each plant is sketched on a map of the line transect.



The location and area of dandelion plants found along the line transect.



A belt transect is a strip 25 cm wide that is marked out by setting out a second line parallel to the original transect line.

The plants between the lines or touching the space between the lines are counted and then mapped on a sheet of squared paper.

When the number of plants along each 25 cm of the line or belt transect is compared, you are able to see very easily by numbers the amount of unevenness that exists in the spread of the plants. You can now examine the area to find conditions that may explain why the plants are unevenly spread. Some of these conditions might be:

1. the direction from which the wind usually blows.
2. obstacles that would produce wind breaks and cause seeds to pile up.
3. closeness to concrete or asphalt or similar surfaces that cannot easily hold seeds.
4. amount of moisture for growth.
5. kind of soil.
6. extent to which an area is trampled by people or animals.
7. amount of protection the area receives from winds.

Can you think of some other conditions?

Activity 3

How does the number of dandelion plants change over an area?

Find a grassy area along a sidewalk or path where the number of dandelion plants is noticeably greater than in the surrounding area.

Mark with string a belt transect 25 cm wide cutting through this area. Be sure to include places where there are a great many dandelions and other places where there are only a few dandelion plants.

Prepare a sheet of paper for mapping as shown. Each square on the map represents a 25 cm square in the area being studied.

Examine the belt transect one square at a time and record the number of dandelions found and the area covered by each plant.

Digging Deeper

Which square contained the greatest number of dandelions? the least?

Was there a steady change in numbers of dandelion plants from square to square?

In what direction does the wind usually blow in your area? You can obtain

this information by asking your teacher, writing to the weatherman, checking wind direction as it is shown in your local newspaper or by measuring the wind direction yourself over a period of time.

Use an arrow to show the direction from which the wind usually blows.

How would you explain the difference in the spread of dandelion plants in the area that you studied?

Branching Out

Complete a belt transect to show how *all* the plant life is distributed in one or more of the following areas. Look for areas where changes are noticeable:

- (a) a woodland area,
- (b) the edge of a woodland,
- (c) a fencerow
- (d) a vacant lot,
- (e) an abandoned field.

Which plant is most abundant? What reasons can you suggest to explain why?

Distribution of plant life along a fence-row and at the edge of a woodland.



The Dandelion And The Mini-Climate

4



4. The Dandelion And The Mini-Climate

The dandelion is important to the world right around it. To the casual observer, it may be hard to believe that this commonplace weed affects other nearby plants, is important to a number of small animals, and has an effect upon temperature, moisture, and soil conditions. In this chapter, you will examine the world immediately around the dandelion plant, and observe and record how the dandelion affects that world. The learning that you gain from the study of how the dandelion affects the small world in which it lives may help you to better understand how plants and animals affect each other in the larger world. If you examine the book entitled *Mini-climates* that is part of this series, you will find many activities that will help you to study the conditions in the small world right around a dandelion plant.

Activity 1:

How does the dandelion affect other plants growing near it?

Dig up a number of large dandelion plants growing on your lawn. Observe the ground surface that was covered by the plant.

Find a healthy, young dandelion plant. Enclose this plant in a quadrat frame that is 25 cm square. A quadrat frame for this purpose can be made by using a wire coat hanger. Simply bend the coat hanger into a 25 cm square using a pair of pliers.



How many plants are found growing under a dandelion plant? Explain your answer.

Count the number of plants contained within the quadrat. If the area that you chose has a large number of grass plants, it may be difficult to count them. Nevertheless, try to count all of them.

At weekly intervals, record the changing number of plants in the quadrat.

Will the number of plants around the dandelion change as the dandelion grows?



Why are no plants growing close to the ground?



Digging Deeper

How many plants did you find growing on the ground surface covered by the dandelions? Were other plants growing there at one time? What do you think happened to those plants?

Over a period of weeks, what changes took place in the size of the healthy, young dandelion plants and in the number of other plants enclosed in the 25 cm square quadrat?

How does the dandelion affect other plants around it?

How are the leaves of the dandelion plant arranged so as to completely cover the ground surface of the lawn?

Branching Out

Examine areas where the foliage of plants is very dense. Some areas might be a densely populated woodlot or under a heavily-leafed bush. How abundant are the small plants covering the ground? Explain why.



A light meter being used to measure the intensity of light. How much light do plants require in order to live?



A simple device for measuring the area covered by a dandelion.

Activity 2:

How much ground surface does a dandelion plant cover?

Obtain a sheet of clear plastic, about 50 cm square.

Divide the sheet into 1 cm squares. Use a felt pen for drawing the lines.

Locate at least six large dandelion plants. Cover each of these plants, in turn, with the plastic sheet.

Calculate the area covered by each dandelion in square centimetres by adding the following:

- the total number of 1 cm squares completely covering the dandelion plant

plus

- half the number of 1 cm squares partially covering the dandelion plant.

Record the information on a chart.

Select a young, healthy dandelion plant and find, in square centimetres, the area covered by this plant. Return at 1-week intervals to find the change that has taken place in the area covered by the plant. Keep a record of this information and plot a graph to show the changes that you observed.

Digging Deeper

What was the greatest area covered by a dandelion plant?

What was the average area covered by the six plants that you measured?



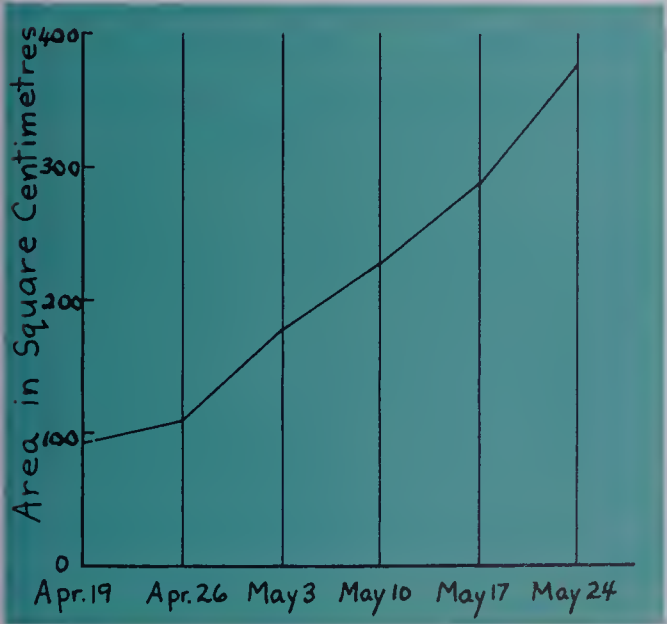
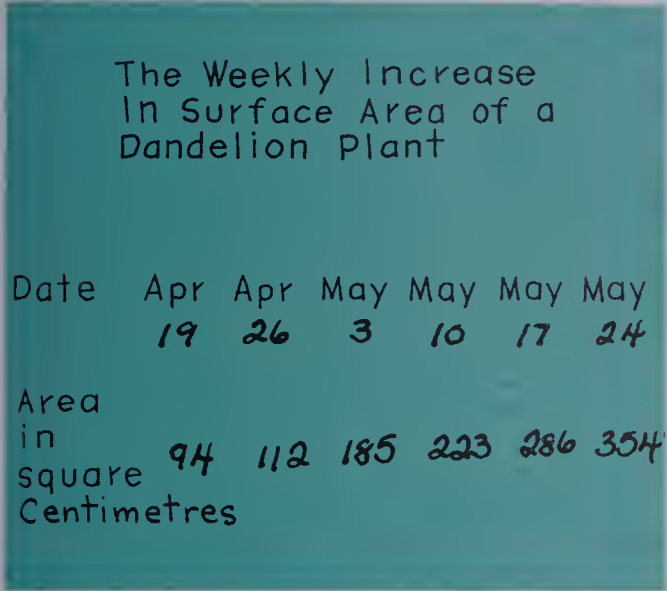
How Much Area Does a Dandelion Plant cover?

Dandelion	Number of cm^2	Number of partial Squares	Area
1	87	14	94 cm squares
2	304	72	340 cm squares
3	214	56	242 cm squares
4	418	108	472 cm squares
5	169	44	191 cm squares
6	286	62	317 cm squares



What amount of ground surface does a dandelion plant cover?

By how much did the surface covered by the dandelion plant increase week by week?



Branching Out

Repeat Activity 2, using the common plantain instead of the dandelion. Compare the two plants to note differences in areas covered and rates of growth.



Does the common plantain cover the ground surface as quickly as the dandelion?

Activity 3:

How does a dandelion plant affect the temperature at the soil surface?

Obtain three identical thermometers and standardize them (see Chapter 1).
Place the bulb of one of the thermometers under the leaves of a dandelion plant.
Place the second at the ground surface of a grassy lawn.
Place the third in an area of bare soil, making sure that the bulb is lightly covered with soil.
In each case, the bulb of the thermometer should be protected from the direct rays of the sun.



What variable will most affect the temperature readings?

Temperature Readings at the Soil Surface at Three Different Places

Time	Under Dandelion Leaves	Grassy Lawn	Bare Soil
09:00	15°C	13°C	13°C
10:00	17°C	19°C	20°C
11:00	21°C	23°C	27°C
12:00	27°C	32°C	34°C
13:00	29°C	34°C	38°C
14:00	30°C	35°C	40°C
15:00	24°C	27°C	35°C
16:00	23°C	26°C	32°C
17:00	22°C	25°C	30°C

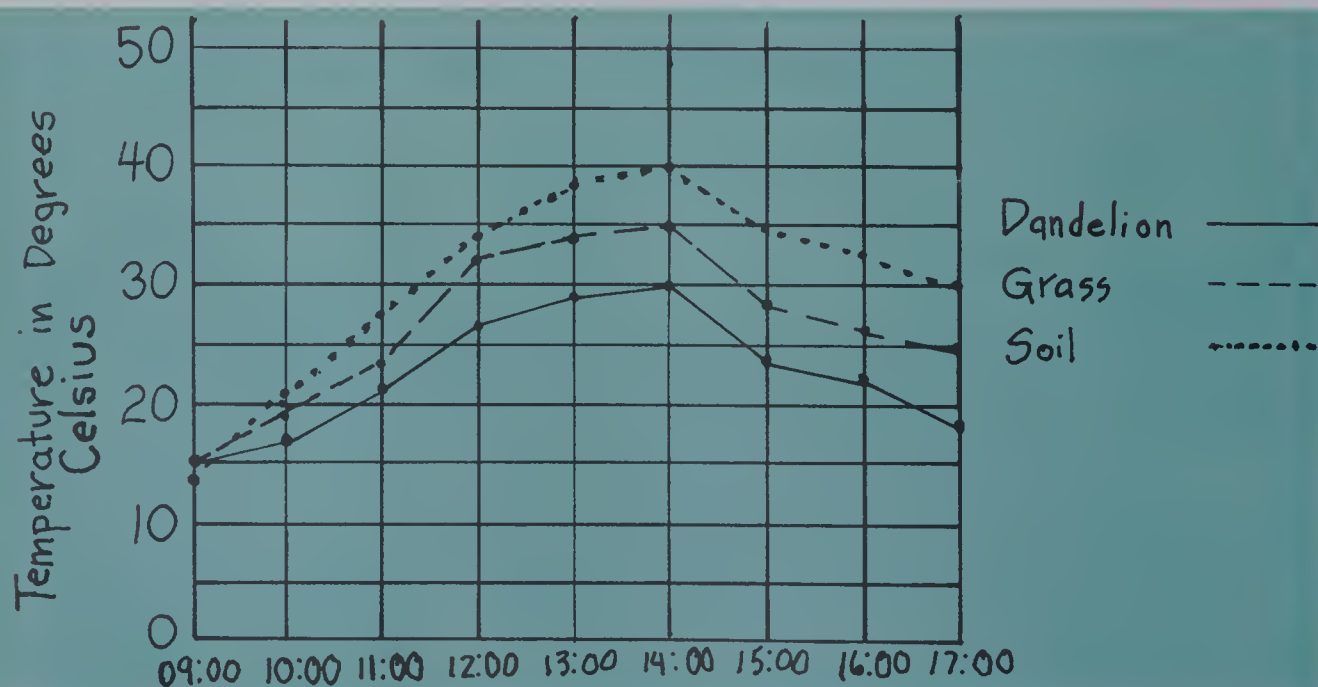
Note the temperature readings of each thermometer on a clear, sunny day at one-hour intervals, starting at 09:00.

Record your information on a chart like the one shown.

Obtain two maximum-minimum thermometers. Place one on the ground surface under the leaves of a dandelion plant.

Leave the other lying on the ground surface beside the dandelion plant. This activity is best done in your own backyard to avoid loss or damage to the maximum-minimum thermometers.

Note the minimum temperature shown by each of the maximum-minimum thermometers during a night when the sky is clear.





A maximum-minimum thermometer shows the high and low temperature at a particular place over a period of time. To reset these thermometers, use the magnet to pull the magnetic indices (markers) in each glass tube back to the surface of the mercury.



Why does the ground surface cool quickly during a night when the sky is clear of clouds?

Digging Deeper

What was the highest temperature of the ground surface recorded under the dandelion leaves, the grass, and on the bare ground?

What was the lowest temperature in each location? In which location did the temperature change the most?

What was the average temperature found in each location?

What effect did the dandelion leaves have on the ground surface temperature?

How might this have affected tiny animal life living under the leaves of the dandelion?

Display the temperature readings that you have recorded on a line graph. Are the temperature differences seen more easily on the chart or on the graph?

How great a difference did you find in the readings of the two maximum-minimum thermometers?

Where was the lowest temperature reading found?

Explain why the air under the dandelion leaves remained warmer than the air that was not sheltered by dandelion leaves.

Branching Out

Read in books about the weather, how and when dew and frost are formed.

Activity 4:

How does a dandelion plant affect the amount of moisture in the soil?

Select a large dandelion plant that can readily be used for observation.

After a heavy rainfall or after a heavy sprinkling with a hose, feel the ground under a dandelion plant and the ground of a nearby bare surface. Compare the moisture in the soil in both locations.

Each day, over a period of several days, feel the two ground surfaces and describe the changes that take place in the amount of moisture in the ground.



Digging Deeper

How did the moisture in the two soils compare at the beginning of this activity?

Which soil dried up more rapidly?

How does the dandelion plant reduce the speed with which the moisture leaves the soil?

Activity 5:

What animals are found on and around the dandelion?

Observe, at various times over a number of days, a dandelion plant which has several blooming flowers.

Keep a record of the number and type of animals that visited the dandelion.

Carefully raise the leaves of a dandelion plant from time to time and probe

Why does the soil under a dandelion plant remain moist longer than bare soil?

into the earth with a knife to discover if any other animals are to be found there.

Digging Deeper

What was the largest number of animals to visit the dandelion during one period of observation?

How many different kinds of animals visited the dandelion altogether?

What did these animals appear to do while they were at the dandelion?

Were most of the animals insects?

Were the animals as numerous during a sunny day as during a dull day?

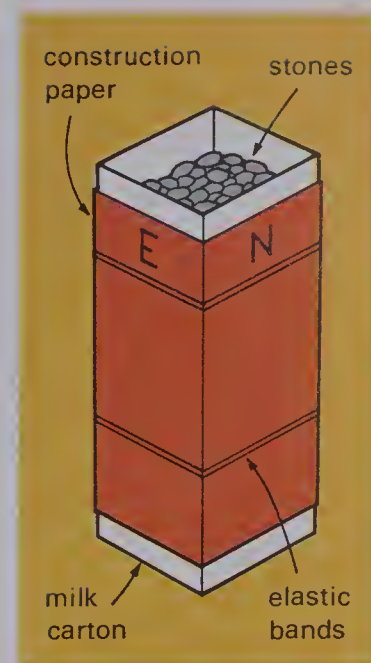
Were the dandelion flowers as wide open during dull weather as they were during sunny weather?

What kinds and numbers of animals did you find under the leaves of the dandelion?

Why do insects visit the dandelion flower?



Time of Observation	Number and Type of Animal	Weather Conditions
09:00 - 09:15	3 ants	clear sky, sunny, cool
11:45 - 12:00	12 worker bees 1 bumble bee 3 unknown x 2 unknown y	warm, bright sunny sky



Why should both splash pillars be placed in the same direction?

Were the same kinds of animals to be found in the bare ground near the dandelions?

Were any animals to be found eating dandelion leaves?

Activity 6:

How do dandelions protect the soil from erosion?

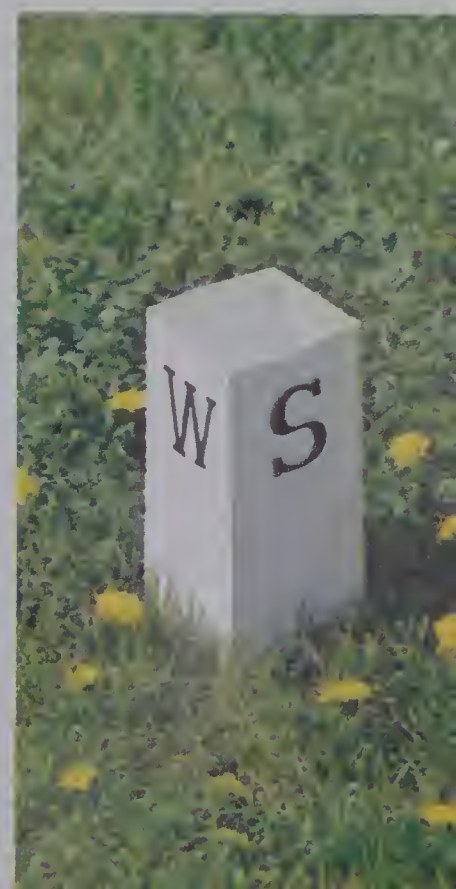
Construct two splash pillars.

- Obtain two one litre cardboard milk cartons, some light colored paper such as newsprint or light construction paper, stones, elastic bands, and a compass.
- Fold the paper around each milk carton so that all four sides are covered. Hold the paper in place with the elastic bands.
- Place stones in the bottom of each carton so as to hold it in place.
- Mark the top of each side of each carton with N, E, S, or W.

Just before a rain storm, place one splash pillar on an area completely covered by dandelions and the other

in the middle of a bare garden. Position the splash pillars in a N, E, S, and W direction by using the compass. Bring the splash pillars indoors when it is apparent that there is considerable evidence of splashes on the paper. If the splash pillars are left out too long, the rain could erase some of the splash marks.

Remove the paper from each splash pillar and compare the splash records.



How is the dandelion plant enriching the soil?

Digging Deeper

Which paper showed the greatest amount of mud? How high did the mud reach?

On which side of the splash pillar was there the greatest evidence of splash? Why?

Why was there less splash erosion from the dandelion-covered surface than from the bare soil?

Branching Out

Use your splash pillars to find the comparable amount of splash from other surfaces.

How do plants such as dandelions help to reduce erosion?

Activity 7:

What happens to the dandelion plant during the winter?

In the late fall, just before the first severe frosts appear, find a large dandelion that you can visit a number of times during the late fall and in early spring.

Describe the changes that take place after the dandelion has been subjected to a number of severe frosts.

Note the appearance of the dandelion plant in the very early spring.

Digging Deeper

What happens to the dandelion leaves when freezing weather sets in?



In the early spring, rub the old remaining leaf material between your fingers. How does it feel? What color is it? Dead plant material changes into *humus*. What is humus? In what way is the dandelion plant enriching the soil?

How do you know that the dandelion plant does not die during the winter-time?

Describe how the dandelion plant comes to life again in the early spring.

Dandelion plants starting to grow again in the spring.





5. A Most Persistent Weed

To the person who is interested in maintaining a beautiful, even, green lawn, or to a person who is proud of a weed-free garden, the dandelion is nothing less than a persistent nuisance. To such a person, this weed seems to attain almost human qualities in its determination to turn aside his attempts to eliminate it. How disappointing it is to someone who has spent hours rooting out the dandelions from his lawn to find, on the following morning, a sprinkling of yellow blossoms across his lawn. It almost makes one wonder who the real owner of that lawn is, the person, or the dandelion.

In this chapter, we shall be examining some of those things that enable the dandelion to be the persistent weed that we know so well.

Activity 1:

How many seeds are produced by one dandelion flower-head?

Select a fully ripened dandelion flower-head that has not lost any of its seeds and pick all of the seeds from it.

Count the seeds and record the number on a chart.

Repeat this activity by counting the seeds in 9 other dandelion flower-heads.

What is the total number of seeds that you found?

Divide this number by 10 to find the average number of dandelion seeds in one flower-head.



Make a chart which shows the number of dandelion seeds found in each of 10 dandelion flower-heads.

Do all dandelion flower-heads contain the same number of seeds?

Digging Deeper

What was the least number of seeds found in one dandelion head?

What was the greatest number of seeds found in one dandelion head?

Compare your answers with those found by other members of your class to discover the smallest and the largest number of seeds found in one dandelion flower-head.

What is the average number of seeds found on a dandelion flower-head? Would you have obtained a more accurate answer if you had averaged more than 10 dandelion flower-heads? Explain your answer.



How many seeds are produced by a petunia flower?

In what way are the seeds produced by these plants like those produced by the dandelion?



Examine the bald head of the dandelion with a magnifying glass. Note the tiny dark spots. Count the number of spots. Is the number of spots the same as the number of seeds that you collected from the flower-head? These spots mark the place where the dandelion seeds were fastened. How can you find out how many seeds a dandelion flower produced long after all the seeds have been dispersed, or scattered?

Branching Out

Gather the seeds of other flowers such as snapdragons, petunias, and plantain from your garden and from a field. Compare the number of seeds obtained from these flowers with the number obtained from a dandelion flower.

Compare the number of seeds produced by a milkweed flower, a thistle flower, and a cattail, with the number produced by an average dandelion flower-head. In what way are all these seeds alike?





How would you decide when the dandelion flower is ready to bloom?

plants? How could you find out for sure?

What do you think are the conditions that would enable the dandelion flower to turn to seed most quickly?

What is the average number of days required for a dandelion flower to turn to seed?

Activity 2:

How long does it take for a dandelion flower to turn to seed?

Find a dandelion flower that has just started to bloom.

Mark it in some way so that you can return to the same flower over a period of days.

Keep a record of the number of days that pass until the dandelion flower has fully turned to seed.

Determine the number of days that it requires for 4 other dandelion flowers to turn to seed. Choose dandelions from areas that are noticeably different.

Digging Deeper

How many days did it require for the one dandelion flower to turn to seed?

Do all dandelion flowers require the same length of time to turn to seed?

Which of the following might account for the difference in time required for dandelion flowers to turn to seed: amount of rainfall, amount of sunlight, temperature, closeness to other

Branching Out

List 6 common flowers of the garden. Beside each place the number of days that is required for that flower to turn to seed.

Find 3 common weeds of the neighbourhood and for each observe the number of days required for the flower to turn to seed.

How does the time required for each of these flowers to produce seed compare with that for the dandelion?

Activity 3:

How does the flower-head change to make the dispersal of seeds easier?

Obtain a dandelion flower that is just starting to bloom, one that is in full bloom, and one in which the seeds are ripe and ready to leave the dandelion head.

Carefully pull out the florets from the dandelion head of the first two samples and the seeds from the third.

Examine the surface to which the dandelion flowers were fastened. Sketch all three of the flower-heads.

In which dandelion head are the seeds most widely separated?



Digging Deeper

Describe the change that has taken place in the flower-head from the time when the flowers first bloomed until the seeds were fully developed. Use the words *concave* and *convex* in your explanation.

Blow away the seeds from a dandelion. How does the convex shape of the dandelion head make it easier for the wind to blow away the seeds?

Are the seeds more spread out when they are ripe than when they are still in the flower stage? Explain your answer. How would wind dispersal of the seeds be made easier if the seeds had more space between them?

Activity 4:

How many seeds can a dandelion plant produce?

Select a dandelion plant early in the spring when the first dandelion flower is noticed.



How has the shape of the flower-head changed as the seeds ripened?

How Many Seeds Can One Dandelion Plant Produce?

Total number of dandelion flowers that appeared in the three week period	28
Average number of dandelion flowers that appeared each day	$\frac{28}{21}$
Number of days in the year when dandelion flowers might appear	182
Approximate number of dandelion flowers that could appear on the plant in the year	$\frac{28}{21} \times 182$
Average number of seeds produced by one dandelion flower	162
Number of dandelion seeds that one dandelion plant could produce	$\frac{4}{21} \times 182 \times \frac{54}{162} = 39312$

Keep a daily record of the new flowers that appear on that plant.

You should be careful to mark them so that each flower is counted only once.

This record should be maintained for a period of about three weeks.

Discover from the weatherman the approximate time when severe frost will strike your area.

Digging Deeper

Over the three-week period of your observation, how many new dandelion flowers appeared in all?

What was the average number of dandelion flowers that appeared each day?

How many days passed from the time you noticed the first dandelion flower until the time of the first severe frost in the fall? Did the dandelion plant produce more flowers after severe frosts had set in?

How many dandelion flowers could that one dandelion plant that you observed have produced during the growing season?

Refer to an earlier activity in this chapter to find the average number of dandelion seeds produced by one dandelion flower. How many dandelion

seeds might be produced by one dandelion plant during a growing season in your area? What conditions might reduce the numbers of flowers and seeds that could be produced?

Branching Out

Using a similar method, calculate the number of seeds that might be produced by one of the vegetable plants growing in your garden.

Activity 5:

How well is the dandelion seed equipped for dispersal?

Carefully pick one dandelion seed from a dandelion flower-head. Examine it under a magnifying glass. Make a sketch of the dandelion seed. Compare the dandelion seed to a parachute.

Drop a dandelion seed and a radish seed from the same height at the same time.

Compare the time that it took each to reach the ground. Measure the distance that each seed landed from the starting point.

Place some dandelion seeds in a container of water.

In what ways are the dandelion seed and the parachute alike and different?

Blow some dandelion seeds against a woolen sweater or against the fur of a dog.

Digging Deeper

In what ways are the dandelion seed and the parachute alike? different?

How far can a dandelion seed travel on a windy day? on a fairly calm day? Try this activity with many dandelion seeds at different places and at different heights.

How long can a dandelion seed float through the air?

Explain why the dandelion seed can be so easily dispersed by the wind.

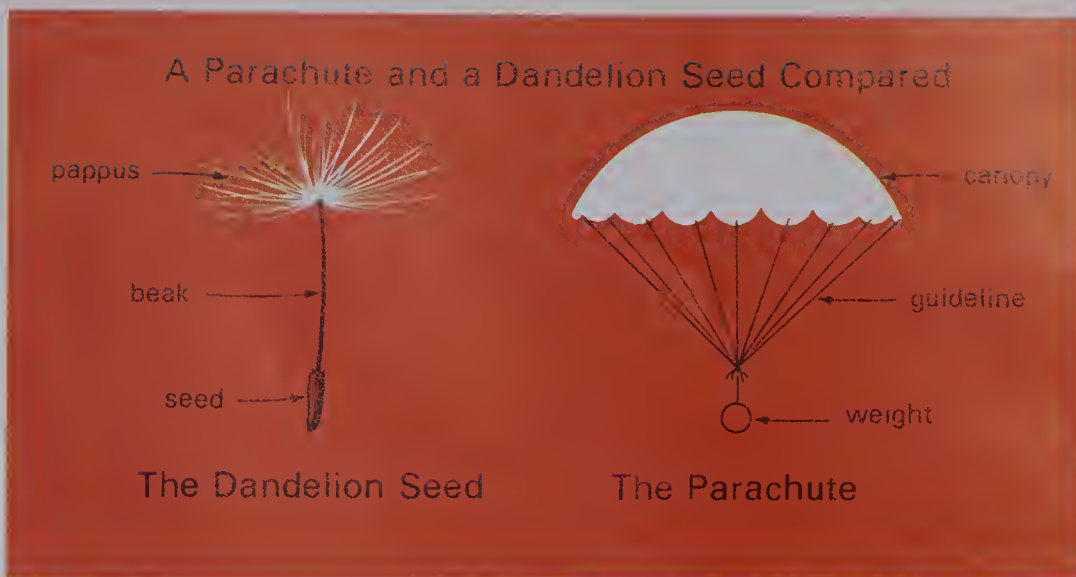
Does a dandelion seed float on water?

How long will it float in a container of water? Can it be carried along by a current of water?

Do dandelion seeds stick easily to clothing or fur? How is the dandelion seed adapted for clinging to objects?



Dandelion seeds and radish seeds.



Is the radish seed adapted in a similar way? How would this adaptation help the dandelion seeds that are blown along the ground?

Why can dandelion seeds be more easily scattered over a large area than radish seeds?

In what other ways can dandelion seeds be dispersed?

Branching Out

How can a parachute be made?

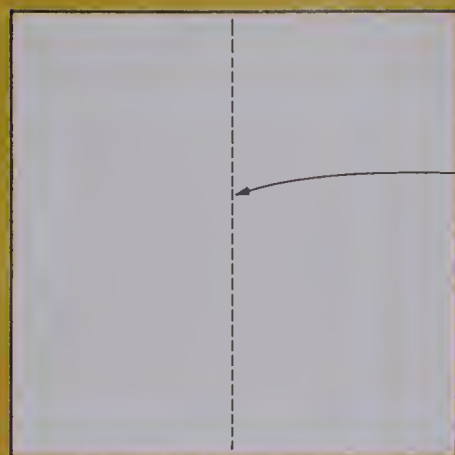
Obtain a square of cloth, tissue paper, or thin plastic sheet.

To make the parachute canopy, fold and cut it as shown in the diagrams on the next page.

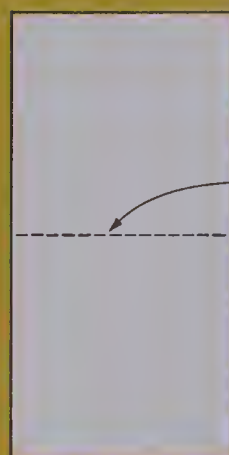
Open up the material and stick gummed reinforcement rings to each or every second one of the scallops.

Cut 8 or 16 strings all equal in length and slightly longer than the diameter of the parachute canopy. Tie one string to each of the reinforcement rings.

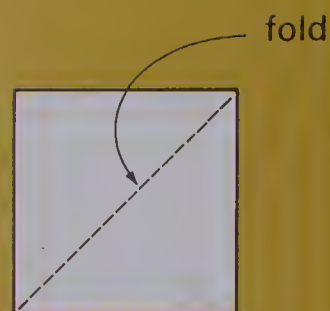
Make the weight from a ball of plasticine having a mass of 10 g. Insert two paper clips into the ball. Attach all of the strings from one half of the parachute canopy to one paper clip and the strings from the other half to the second paper clip.



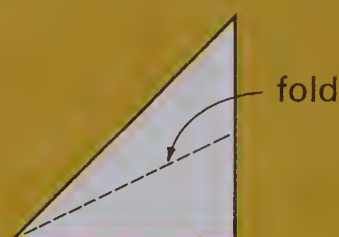
(a)



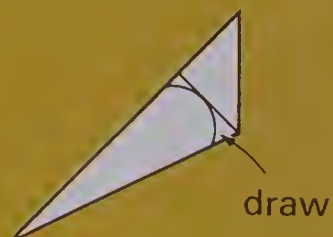
(b)



(c)



(d)

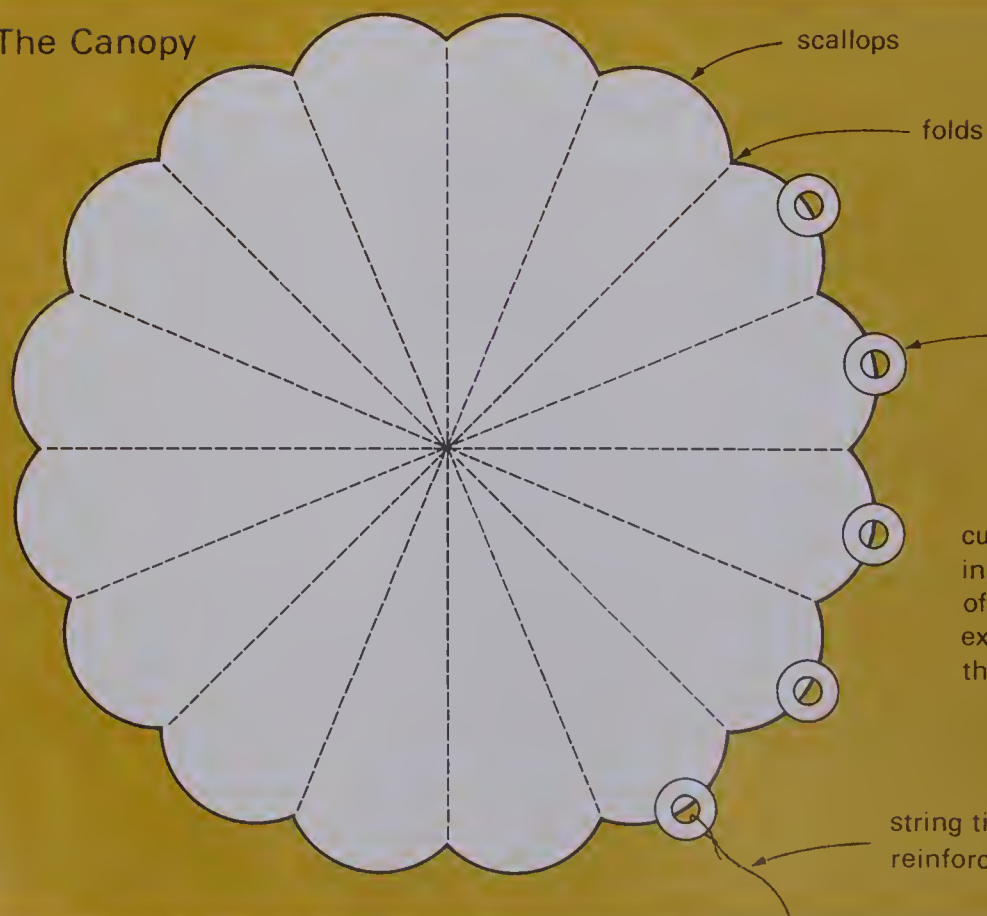


(e)



(f)

The Canopy



cut threads or strings equal in length to the diameter of the parachute plus a few extra inches for tying to the reinforcements.

string tied to reinforcement ring.

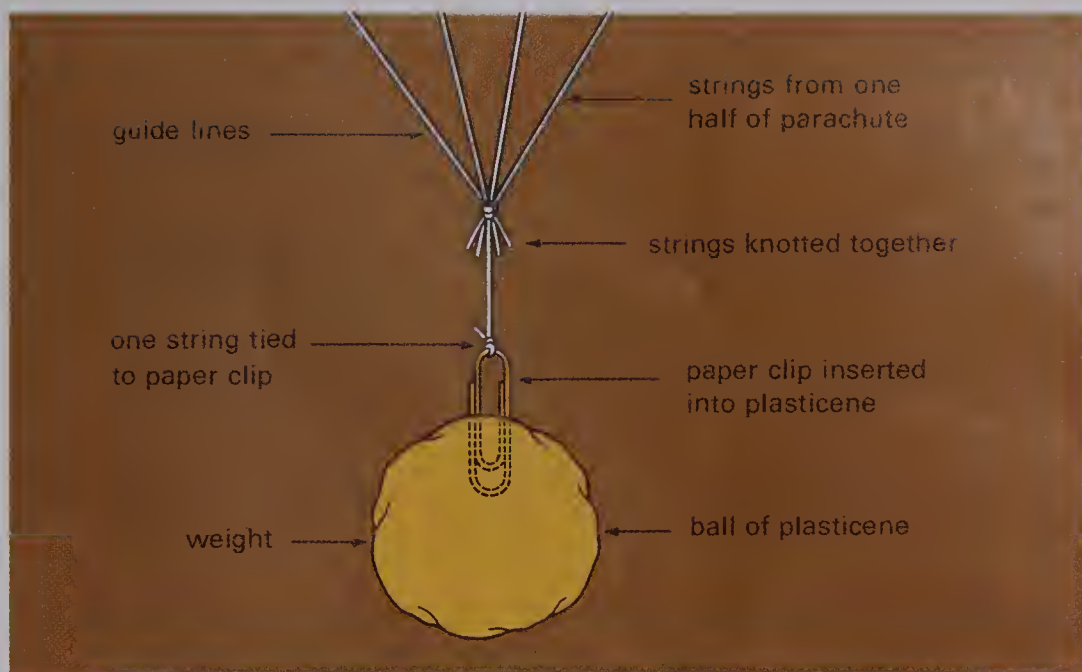
The possibility of getting the strings tangled can be reduced if all the strings from each half of the parachute are tied together first so that about 8 cm of loose ends remains. One of these ends can then be tied to one of the paper clips.

A simpler parachute can be made by tying strings to each corner of an ordinary pocket handkerchief and then to a large washer or nut.

Usually the performance of a parachute is determined by how long it takes to land. The longer that it takes, the more gentle is the landing. Experiment with home-made parachutes to obtain the one that stays longest in the air. How does this one compare with a dandelion seed?

When experimenting with your home-made parachutes, remember, that to be really scientific, you should change only one variable at one time, making several trials before changing the variable or arriving at any conclusion. Work with the following variables:

- Type of material in the canopy. Try different kinds of materials but be certain that the sizes are identical.
- Size of the canopy. Use the same material in each pair. Only the areas of the two canopies should be different.
- Weight used on the parachute.
- The length of the strings or guide-lines.
- The number of guidelines or strings.



(f) The height from which the parachute is dropped.

How does a parachute slow the fall of a person?

Who discovered the use of the parachute?

In what ways are parachutes used other than for emergency departures from aircraft?

What other weed seeds in your area have parachute-like parts that enable the seeds to be easily dispersed?

Find out how the seeds from each of the following plants are adapted by nature for dispersal:

- the maple tree,
- the burdock,
- the witch hazel.

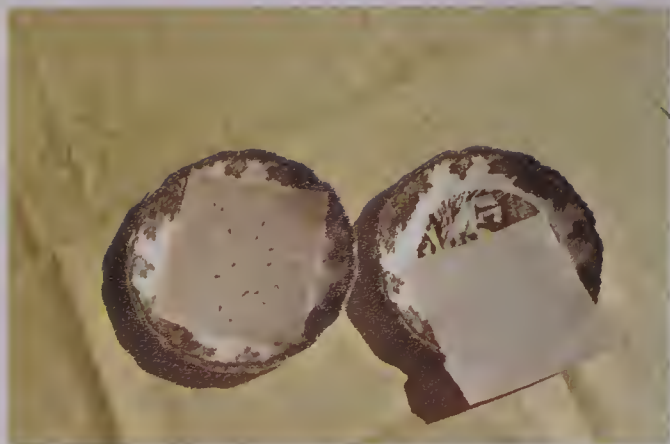
Activity 6:

How many dandelion seeds that are planted will actually grow?

Obtain 25 ripe dandelion seeds from a dandelion flower.

Place them on a moistened blotter that has been placed in a saucer.

A simple device to find out how many seeds will sprout.



Cover the dandelion seeds with another moist blotter and then with an inverted saucer.

Examine the seeds each day and keep a record of the date when seeds start to sprout and the number that sprout. The activity can be stopped when three days have passed without any more seeds sprouting.

Digging Deeper

How many days passed before the first seed sprouted?

What was the total number of seeds that sprouted?

When a seed sprouts it is said to *germinate*. The number of seeds out of a certain quantity that sprout or germinate is called the *germination rate*. For instance, if 25 seeds were tested and 4 sprouted, the germination rate would be 4 out of 25. So that everyone can better understand the germination rate, the percentage of germination is calculated. Percentage of germination is the number of seeds out of 100 that germinate.

Pupil Chart Record of Sprouting of Dandelion Seeds Starting date; May 28

Date	Number of seeds that sprout
May 28	
29	
30	
31	
June 1	

What was the percentage of germination of the dandelion seeds that you tested? In order to calculate the germination rate of the dandelion seeds that sprouted, make a fraction by placing the number of seeds that germinated over 25 which is the total number of seeds that you used in this activity. Change this fraction to denominator 100. It will then tell you the number of seeds that would have germinated if one hundred seeds had been tested. This also gives the percentage of germination.

Example

Number of seeds that sprouted
or germinated out of 25 was 19

Fraction that is formed $\frac{19}{25}$

Fraction that is formed with
denominator 100 $\frac{19 \times 4}{25 \times 4} = \frac{76}{100}$

Germination rate is 76 percent 76%
Compare the answer that you obtained
with that of other students in your
class.

Why were 25 seeds used? What other
numbers of seeds could have been
used to obtain equally good results?
Try different numbers and calculate
the germination rate.

How would your answer compare if you took one seed from each of 25 different dandelion flowers and conducted this test?

What conditions does a seed seem to require in order to sprout or germinate? Why would some of the seeds not germinate? Would these seeds germinate later or under different conditions?

Branching Out

Try the germination test with bean seeds. What is the germination rate?

What would a farmer consider a good germination rate for wheat seed?

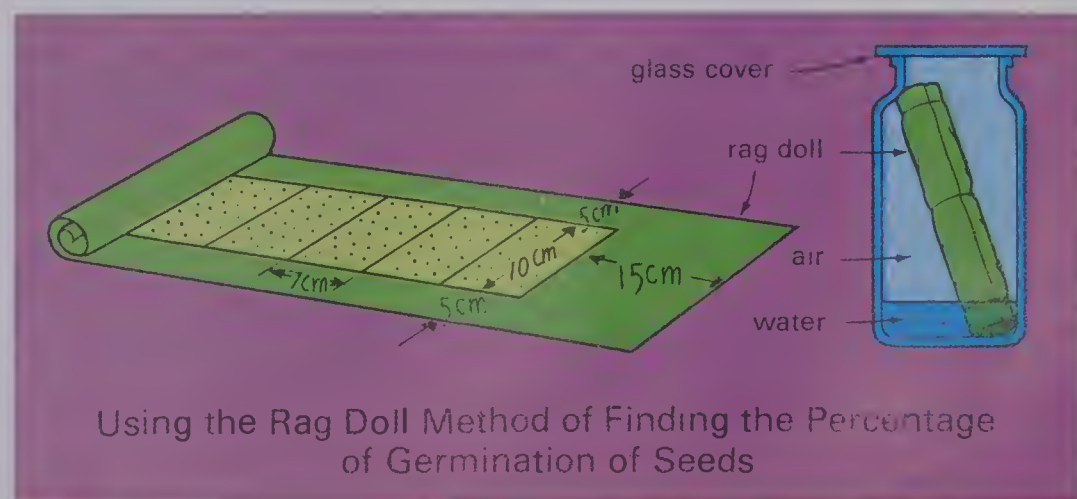
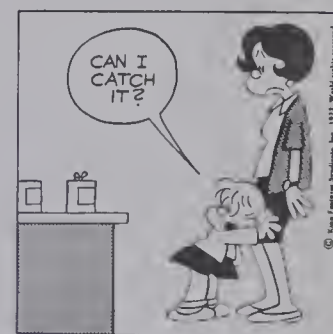
Scientists believe that many seeds, particularly those that grow wild, have a built-in mechanism that prevents them from all germinating at the same time. Why would it be a useful adaptation for a plant such as the dandelion not to have all of the seeds germinate at one time?

Study the illustrations showing another method that may be used to test the germination rate of seeds. How does it compare with the saucer and blotter method?

Obtain a piece of soft cloth about 20 cm wide and 1 m long. Leave a margin of 15 cm at each end and 2 cm along the sides. Divide the remainder into rectangles each 10 cm x 7 cm. Use one rectangle for each sample of seed to be tested, spacing 25 seeds on it as evenly as you can. Samples can be from different dandelion heads on

the same plant, from dandelion heads from different plants, and from different kinds of weed seeds. Perhaps you can think of other seeds to try. Carefully roll up the cloth from one end. Tie it loosely near the middle and near both ends as shown in the illustration. Place the *doll* in warm water until it is soaked through, then rest it on one end in a jar containing about 3 cm of water. Make sure that the water remains about 3 cm deep. Cover the container loosely. Leave the jar and the *doll* in a warm place for 10 d.

To make your observations, very carefully roll back the cloth after 3 d, after 5 d, after a week and then after 10 d. On these dates, and for each sample, count and record the number of seeds that have germinated strongly, that have germinated weakly, and that did not start to germinate. For each sample, calculate the percentage that (a) germinated quickly and strongly, (b) germinated slowly and produced weak seedlings, and (c) did not germinate.



How does spraying with 2, 4-D affect the dandelion?

Activity 7:

How do weed killers affect the dandelion?

Read the labels on some cans of weed killer in your garage or at the local hardware store or nursery.

Find a product that contains the ingredient 2,4-D.

Obtain a weed killer containing 2,4-D, and follow carefully the directions to prepare a proper dandelion killing mixture.

Select two similar dandelion plants close to each other.

Spray one dandelion plant with the weed killing spray and leave the other one untouched.

Carefully observe and compare the two dandelion plants over a two-week period. Look for changes in leaf color, size of leaves, length and shape of flower stems, and the feel of leaves.

Sketch the changes that you observe. Record on a chart the measurements that you have made of changes in the size of the leaves and flower stems.



How many of your neighbours work at getting rid of dandelions in this way?

Digging Deeper

How many days passed before you noticed a significant difference between the two plants?

What unusual changes took place in the plant that was sprayed? Measure the rate of growth of some of the leaves and flower stems.

Compare these measurements with those taken of the plant that was not sprayed (the control plant).

What differences do you note in the feel of the two plants?

How much time passed before the sprayed plant could be called dead?

Branching Out

What kinds of plants are killed by weed killers containing 2,4-D?

Read to discover how 2,4-D is able to kill weeds like the dandelion.

What other weed killers are available that will kill the dandelion?

What is the effect of 2,4-D weed killers on grass?

Is there any long-term effect on the environment when too much plant killer or *herbicide* is used?

Activity 8:

How effective is “digging out dandelions” as a way of eliminating them?

Some people believe that the best way to rid a lawn of dandelions is to dig them out one at a time. Often a knife



is used to cut away as much of the dandelion plant as can be readily removed. This technique requires considerable time and hard work to clear the lawn. The following activity will help you to discover how successful this method is.

Measure an area 10 m square on your home or school lawn.

Use a knife to cut off all the dandelions visible in this area.

Observe the area for a period of two weeks to see if any dandelion plants have reappeared.

Digging Deeper

How many dandelion plants did you dig up with your knife from the area that was marked out?

How long did it take you to remove the dandelion plants?

How long did the marked-out area of your lawn remain free of dandelion flowers and plants?

How many dandelions reappeared by the end of two weeks? Did these dandelions grow from the ones that were dug up or did they grow from seed? How do you know? How effective is *digging out dandelions* as a way of eliminating them from your lawn?

Branching Out

Find six large, healthy dandelion plants growing around your home or school. Place a numbered marker (pop-sicle stick) beside each so that they can be easily found again, and cut them as described below. Each cut should be made straight across rather than at a slant.

Cut off only the leaves of the first plant.

For the second plant, cut off the top one inch of the root.

For each of the other dandelion plants, cut off one additional inch of the root.

Observe the plants over a period of several weeks.

Did all of them survive?

Does cutting the dandelion root at an angle instead of straight across have any effect on its survival?

Repeat *Activity 8*, using a device especially made for removing the root of the dandelion plant. Do this activity shortly after a rainfall.

Was your dandelion digging activity more successful this time than when done earlier in this activity?

Obtain a dandelion root and cut it



into 4 or 5 pieces. Plant each piece in a container of garden soil. How many of the root pieces produced new dandelion plants? How small a piece of dandelion root will produce a new dandelion plant? Will a piece of dandelion root that is split produce a new dandelion plant?

Some gardeners suggest that digging up dandelions even with all the roots is a useless activity since the hole that is left will soon be a home for a new dandelion plant that grows from a seed. Do you agree? Explain your answer.

Why would these devices be more successful than a knife in removing dandelions from a lawn?

Activity 9:

What effect does trampling have on the dandelion plant?

Examine an area of a park or of the school lawn that has been used as a pathway.

Compare the number and condition of the dandelion plants found on this pathway with those found on the untrampled lawn next to the pathway.

Digging Deeper

Were there more or fewer dandelion plants on the trampled pathway than on the untrampled lawn?

How did the trampled and untrampled dandelion plants compare in appearance?

What would happen to trampled dandelion plants if they were protected for a few weeks?

What would happen to the dandelion plants if you deliberately stepped on them repeatedly over a period of time?

Can you plan and carry out an experiment to test your answer? Some of the things that you should consider in this experiment are the number of dandelion plants to be trampled; the amount of trampling to be done each day; the length of time the experiment will be carried out; and the control area. Can you think of some others?

Is grass better able to stand trampling than the dandelion? How do you know?

Activity 10:

How does frequent mowing of a lawn affect the dandelion plants that are growing there?

Find a large, healthy dandelion plant growing on a lawn that is cut at regular intervals and another large, healthy dandelion plant growing in a field among other plants that are 30 cm or more in height.

Compare these two plants using the following headings:

- (a) number of leaves,
- (b) length of leaves,
- (c) angle of the leaves from a horizontal position,
- (d) length of flower stem.

Digging Deeper

What was the length of the longest dandelion leaf found in each location?

A device which can be used to measure the angle of the leaves.



	Dandelion on lawn	Dandelion in field
Number of leaves	13	11
Length of leaves	15 cm	25 cm
Angle of leaves	0°	75°
Length of flower stem	20 cm	45 cm

How does the dandelion adapt to frequent mowing?



How does the dandelion adapt to meet the competition for sunlight provided by tall growing plants?



What was the average length of all of the dandelion leaves found on each plant?

How many leaves were found on each dandelion plant?

In general, at what angle to the horizontal were most of the leaves on the dandelion growing on the lawn?

At what angle were most of the leaves on the dandelion plant growing in the field?

In which location did the dandelion plant have the best exposure to sunlight?

What might happen to the dandelion plant if the leaves grew flat on the ground surface of a field with many tall growing plants?

What was the average length of flower stem in each location?

What was the length of the longest dandelion flower stem that you found? of the shortest?

Why did the flower stem grow so long in the weedy fields? Shield a flowering dandelion plant so that it is shaded and direct light of the sun does not fall on it. Compare the change from flower to seed with a dandelion plant growing in the bright sunlight. Did the shaded flowers turn to seed? Was the time required for the flower to turn to seed the same for both plants?

Will dandelion flowers turn to seed if they are not exposed to sunlight?



Why does mowing a lawn not kill the dandelion?

Branching Out

Set aside an area of your lawn one metre square with a dandelion plant in the centre. Leave this area uncut for several weeks. Twice a week, record the angle at which the leaves are growing, the height to which the dandelion is growing and the average height at which all the other plants are growing. Record your information on a chart.

How did the angle at which the dandelion leaves grew change?

How did the height to which the dandelion plant grew compare with that of other plants growing around it?

What weeds can be eliminated or controlled by frequent clipping?

You have noticed in *Activity 10* that the dandelion plant is not easily killed by mowing. Many other plants, however, can be eliminated in this fashion. Set aside a section of lawn and let the plants grow to a height of 15 cm to 25 cm.

Notice the type of weeds that are to be found in the lawn at this time.

Mow the lawn closely every three days over a period of two or three weeks. Do some of the weeds disappear? Continue the mowing for several more weeks. Are more weeds eliminated?

Consult your local Department of Agriculture representative to find what weeds common to the farm can be

Date	Average Angle of Leaves	Height of the Dandelion Plant	Height of other Plants

eliminated or controlled by frequent clipping.

Activity 11:

In what different ground conditions do dandelions grow?

Make a survey of your local area to note the different places where dandelions are to be found by themselves and with other plants. Look particularly in gravelled areas, on driveways, along railway tracks, and on asphalt surfaces.

Record on a chart the location of the dandelions and a brief description of

Where do Dandelions Grow?	
Location	Growing Material

Are dandelions very particular about where they grow?



the material in which they are growing. Note particularly those places where only dandelion plants were growing.

Digging Deeper

In how many areas did you find dandelions growing but no other plants present?

Was there any area where the dandelion plants did not grow but other plants did grow?

In what areas were dandelions the dominant plants?

How would you describe the dandelion's ability to adapt to different soil conditions?

Branching Out

What effect on an asphalt surface does a dandelion plant have when it grows there?





What effect does a dandelion plant have on an asphalt surface?

Activity 12:

How is the root of the dandelion adapted to help it survive?

During a long, dry period in summer, when the grass has turned brown, you will likely discover a number of green patches on the lawn. On examining these green patches, you will likely find them to be dandelions. Why are these plants still green when other vegetation has died or turned brown? Carefully dig away the earth from around a dandelion plant until the entire root is exposed. Find other healthy dandelion plants in

the garden or in a farmer's field and carefully dig them up to obtain the complete root system.

Digging Deeper

How long was the root of the dandelion plant that showed green in a brown lawn? As you dug down to obtain this root, did you detect any evidence that the deeper you went the more moist the ground became? What was the greatest length of dandelion roots that you were able to find? In what kind of soil did dandelion roots reach their greatest length?



Why are dandelion plants still green after a lawn has turned brown?

To how great a length can dandelion roots grow?

Why is a dandelion plant better able to survive drought conditions than many other plants?

Branching Out

Organize a competition in your classroom with your classmates to see who can grow the largest dandelion in a ten-week period. Each competitor will start with a seed. All of the knowledge that has been gained from doing the activities in this chapter can be used. There should be no limit of any kind placed on the materials or methods that are used. Each competitor should keep a record of what he does in his attempt to produce the largest dandelion. It is important that everyone understands beforehand what will decide which dandelion is the largest. It might be the length of the root. What other measurement might be considered?



Dallying With Dandelions 6



6. Dallying With Dandelions

Dandelions have been found in all parts of the world for many years. Quite naturally, these common plants have become a part of the everyday life of many people. They have inspired humor. Some people have written poems about them. Others have used the dandelion as food and for other practical purposes. Children have used them in games, and in some countries, interesting folk stories have arisen to explain the existence of this plant. In this chapter, we shall look at some of these lighter aspects of the dandelion.

DANDELION MYTHS

In days long past, people tried, even as they do today, to find an explanation for the everyday things around them. People, then, were often very superstitious and believed in many gods, great and small. They had little or no knowledge of science and so they credited everything that happened around them to their gods. Some of these explanations which were handed down by word of mouth from mother to child are now called *myths*. Following are two dandelion myths that have been passed down to us through the years.

The Love of the South-Wind God

by Miriam Milner French

The South-Wind God delighted to be under fragrant-smelling trees, breathing in the sweetness until his own breath exhaled the same perfume when he blew. One day, so the fable runs, he saw a demure, golden-haired girl, gold as the sun. Every day he

secretly admired and loved her but never tried to approach as he was content to watch her from afar. For many days he looked and loved. But one morning he did not see this girl with the golden hair. In her usual place, he saw a strange creature with faded white and flying hair. He was dismayed. As he gazed upon the ruin, he then realized that the maid with the sun-lit hair had been visited by his brother, the wanton, ruthless North-Wind God. The saddened South-Wind God sighed. His sigh blew all the hair off the poor creature's head and he saw her no more. And now, it is said, every spring the South-Wind God always sighs for his lost love whenever he sees the golden dandelions in bloom.

An Irish Legend

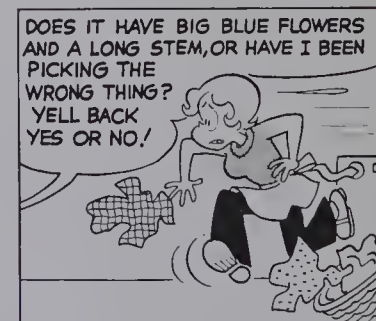
by Sally Wright

It seems that the huge feet of Men suddenly appearing on the earth caused panic among the little people. Elves and gnomes hid in caverns and hollow trees, but the little flower sprites wanted to stay out in the sunshine. So they ran to the nearest plant stems and clung to them in terror. Those dressed in bright yellow, sunbeam frocks found themselves the next morning clinging to a stem, staring wide-eyed at the sun. All the youngsters were in the center, with the adults around the outside for protection. Thus was born the dandelion. Any child can see that is just as the legend has it — hundreds of tiny, yellow flower fairies making up the sunshiny head.

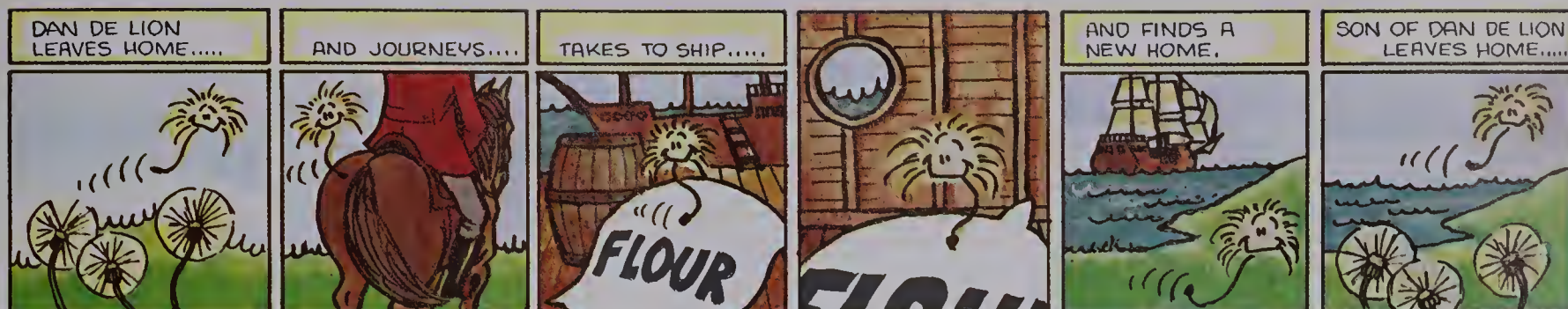
Activity 1:

Can you write your own legend about dandelions?

Imagine that you were in North America when the first dandelions appeared. To describe this event, write a story that might be passed on to future generations.



The Saga of Dan de Lion



FROM WHERE DID THE DANDELION COME?

Dandelions are native plants of Europe and Asia. Like so many other weeds, the dandelion was brought to North America and to other parts of the New World by explorers and colonists.

Activity 2:

Who was responsible for transporting the dandelion to all parts of the world?

Read in your history books to find who were the first men who may have been responsible for bringing the dandelion plant to Canada, United States of America, South America, Australia, and to Africa.

In an earlier chapter, you learned how well the dandelion is adapted for dispersal by winds. Why can we be certain that the dandelion did not arrive in the Western World by using nature's airways?

Branching Out

Prepare a list of six troublesome weeds native to Europe that were carried to this country by explorers.

THE POETRY OF DANDELIONS

Some people have expressed their feelings about the dandelion most beautifully in the form of a poem.

The Dandelions

by Helen Gray Cone

Upon a showery night and still
Without a sound of warning,
A trooper band surprised the hill,
And held it in the morning.
We were not waked by bugle-notes,
No cheer our dreams invaded,
And yet, at dawn, their yellow coats
On the green slopes paraded.
We careless folk the deed forgot;
Till one day, idly walking,
We marked upon the self-same spot
A crowd of veterans talking.
They shook their trembling heads and gray
With pride and noiseless laughter;
When, well-a-day! they blew away,
And ne'er were heard of after!

The First Dandelion

by Walt Whitman

Simple and fresh and fair winter's close
emerging,
As if no artifice of fashion, business,
politics, had ever been,
Forth from its sunny nook of sheltered
grass—innocent, golden, calm as the dawn,
The spring's first dandelion shows its
trustful face.

Dandelions

by Mary Loberg

Dandelions how did you chance
to rest upon my lawn?
Are you beds the butterflies
forgot to hide at dawn?
Are you tiny lanterns
dropped last night by elves at play?
Are you sparks the springtime sun
has sent to earth today?
It seems so strange, for yesterday
you weren't even there.
Perhaps you are the brightest locks
of gold angel hair.

Dandelions

by Frances Frost

Over the climbing meadows
Where the swallow shadows float,
These are the small gold buttons
On earth's green, windy coat.

Activity 3:

Can you write a poem about the dandelion?

Write a poem that shows your feelings about the dandelions. You may, like the poets above, show delight with the dandelion or, if you have had to work hard to get rid of this weed, your feelings may express disgust. Perhaps your poems could tell something that you discovered about the dandelion while you were doing the activities in the earlier chapters.

Branching Out

Find out from your teacher the things to look for when you write a poem.

DANDELIONS FOR FOOD

In the past, and even today, the dandelion is prized as a food. As a green, cooked vegetable, the young, inner, tender leaves of the dandelion are gathered in the spring, thoroughly cleaned, and then boiled. They should not be cooked too long and it is well to change the water once or twice to reduce bitterness. These dandelions are usually served with a lump of butter and a dash of vinegar. Many people prefer to cook the dandelion leaves with a little fat, salt pork, or bacon chopped fine, and to serve them with a sour-cream dressing.

Dandelion leaves can be blanched and used raw as a salad. The blanching improves the flavor. Blanching is achieved by shielding the dandelion plant from sunlight. Two boards in the form of an inverted V, paper, or a large flower pot can be used.

How does the color of blanched dandelion leaves compare with dandelion leaves growing in the open sunlight?



Generally, dandelions that are used for cooking purposes are of specially developed types that have large, juicy leaves. Scruffy dandelions dug from your lawn or garden would likely taste quite bitter. In some countries, dandelions are actually grown as a crop.

For centuries, the dandelion was valued as a medicinal plant. Various preparations of the root were given for the treatment of kidney and liver troubles, gout, and rheumatism. Nowadays, the dandelion is considered practically useless as a medicine. Why do you think that dandelion preparations are no longer used as medicine?

Following are some interesting dandelion recipes:

Dandelion Jelly Salad

20 ml unflavored gelatin
60 ml cold water
40 ml sugar
2 ml celery salt
5 ml onion juice
1 hard cooked egg
425 ml hot water
50 ml vinegar
5 ml salt
1 ml paprika
1 small onion sliced thin
1 can sweet red pepper, minced
1 cup inner tender leaves of dandelion

Soak gelatin until soft in cold water. Dissolve in hot water. Add all other ingredients except egg, and mix well. Cut whites of eggs in rings, arrange around side of mold, which has been rinsed with cold water. Pour in mixture and chill until firm. Turn jelly from mold, garnish with fresh dandelion leaves and blossoms. Serve with salad dressing.



HEY PRIVATE! YOU SURE YOU'VE
MADE DANDELION COFFEE BEFORE?

Dandelion-Root Coffee

During the Civil War, the roots of dandelions were often used as a substitute for coffee in the southern United States. If you did not know what you were drinking, you could hardly tell the difference from ordinary coffee merely by the taste.

Dig up the roots of dandelion plants. Spread them out on newspaper to dry in the sun, or place them on a cookie sheet in the oven at a low temperature to dry over night.

When the roots are completely dry, pound them or grate them to the consistency of ground coffee. Use as you would coffee in your percolator.

To make coffee as it was made in the past, put one litre of water in a pot and add thirty millilitres of dandelion coffee 3 or 4 shakes from a salt shaker. Let the brew come to a boil.

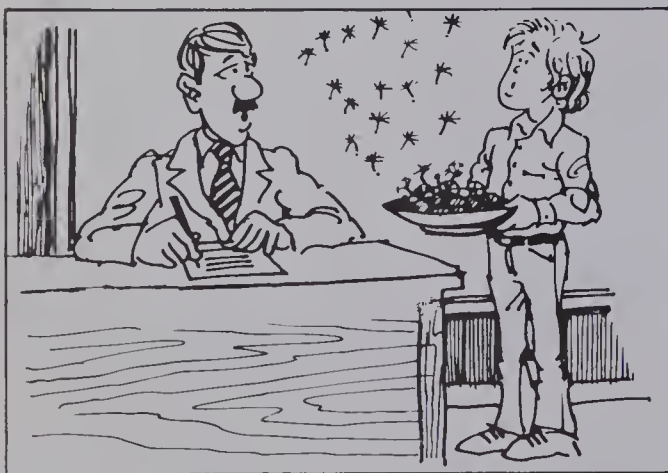
Remove from heat for a minute to let the burner cool a little, then put the pot back on the burner at low heat, and let steep for 10 min.

Dandelion Salad

1 kg dandelion greens
12 slices bacon (about 450 g)
2 cloves garlic, mashed
125 ml red wine vinegar
1 egg, beaten
salt and pepper

Wash young dandelion greens thoroughly, floating them in a large quantity of water in a basin to remove all the soil. Drain greens and dry between sheets of paper towelling. Tear greens coarsely and arrange them lightly in a serving bowl.

Cut the bacon into 1 cm pieces and combine them in a skillet with the garlic. Set pan over moderate heat and cook bacon thoroughly without letting it become crisp. Remove and discard cloves of garlic. Slowly, to avoid splattering, stir the vinegar into the bacon and the rendered fat in skillet. Let mixture heat through to blend the flavors and remove pan from the heat. Let dressing cool and pour it over greens in bowl. Blend in the beaten egg and season salad with salt and pepper to taste. Serves 6.



IT'S A NICE SALAD LARRY, BUT
PERHAPS YOUNGER DANDELIONS...

Dandelion Omelet

250 ml dandelion hearts
4 eggs

Fry the hearts of very white dandelions in butter or butter substitute, and mix them with the well-beaten eggs. Cook like an ordinary French omelet. The taste resembles an asparagus-top omelet.

Dandelion Sandwiches

Use a slice of whole wheat bread and a slice of white bread for each sandwich. Butter with sweet butter and spread the finely chopped very young dandelion leaves.

Activity 4:

How can a lunch of dandelions be prepared?

As a class project, plan and prepare a pioneer dandelion lunch. As much as possible, each item on the menu should contain dandelions. Considerable advance work will have to be carried out if it is necessary to obtain blanched dandelions and dandelion roots to make coffee. It might be wise to conduct small-scale tests of the various items in the menu before the lunch is held. This might assure a more tasty meal. Be careful to avoid using any dandelion plants that have been sprayed by weed killers or other chemicals.



Branching Out

Knowledge of edible weeds has saved many travellers, explorers, and woodsmen from starvation. Many people, if lost in the wilderness, would starve to death with plenty of food around them, simply because they would not recognize it or know how to prepare it. Edible plants of many types grow in back yards, vacant lots, parks, nearby fields, and woodlots. Examine books and other materials at your local library, and enlist the help of your teacher or parents to prepare a list of edible plants growing in your area. Be sure to provide sufficient information on how to identify each plant, and how each plant can be used. Many plants are poisonous, so it is very important to correctly identify any plants that you plan to eat.

Collect some ripe dandelion seeds in the fall and plant them in flower pots. Place the pots on a window ledge that has exposure to much sunlight. Soon, you should have a supply of fresh salad greens available for use during the winter.

Preparing a dandelion salad.

USING THE DANDELION AS A DYE

The parts of many plants can be used as a source of native dyes. While these native dyes do not hold their color as well and do not come in as great a variety of shades as commercial dyes, there is a certain satisfaction in using them. They can be used to dye cotton, woolen, linen, or rayon materials. A greater appreciation of the efforts of pioneers in dyeing their clothes comes from an understanding of the techniques that they used.

Activity 5:

How can dandelions be used to dye cloth?

The roots of dandelions can be used to make a reddish violet dye. These roots are best collected in the fall. To make the dye, chop the roots into fine pieces, soak overnight, and then simmer in a small amount of water for an hour or more (even up to four hours) until the desired intensity of color is obtained. Then strain the dye to remove all plant materials. The result is a concentrated dye. A certain amount of experimentation may be required to obtain a satisfying color.

When dyeing, place sufficient water in an enamel kettle to cover the cloth to be dyed. Add the concentrated dye to the water and bring to a boil. Place the cloth in the dye bath. Dye to the desired shade, remove, wring out, and dry.



Dandelions in water in the dye pot over the fire.

To make the dye fast or permanent, the material may be treated before dyeing. To treat the cloth, make an alum bath, using one ounce of alum to a gallon of water. For woolen cloth, add 8 g of cream of tartar. For cotton, linen or rayon, add 8 g of washing soda. Boil the cloth for at least an hour, rinse well, and dry before placing it in the hot dye bath.

Make some dandelion dye and use it on some unbleached cotton, woolen, rayon, or linen cloth. Try some *tie-dyeing*.

Branching Out

The following is a list of native materials from which dyes can be made:

<i>Materials</i>	<i>Dye Color</i>
Cherry bark	Salmon
Sassafras roots	Pink



Raspberries	Dark red
Beets	Red violet
Strawberries	Red
Mountain Ash berries	Orange
Bloodroot roots	Yellow orange
Goldenrod plant and flowers	Yellow
Pear leaves	Yellow (dull)
Sumac roots	Yellow
Sumac leaves	Yellow brown
Celladine	Yellow
Willow leaves	Yellow
Elderberry leaves	Green
Rhubarb leaves	Light green
Plantain leaves and roots	Green
Larkspur flowers	Blue
Blackberries	Blue
Pokeweed berries	Purple
Dandelion roots	Reddish violet
Birch bark	Rose tan
Willow bark	Rose tan
Horse chestnut husks	Reddish brown
Sumac bark	Brown
Butternut bark	Brown
Walnut hulls	Rich dark brown

Prepare a number of native dyes and compare the quality of these dyes with the dyes used in your clothing.

PLAYING WITH DANDELIONS

For ages, young people have enjoyed playing with dandelions. The following activity shows various ways in which dandelions can be used at play.

Activity 6:

How can dandelions be used at play?

Study the photographs on the next page.



Make a jade necklace by cutting dandelion stems into sections and stringing them.



Do you like butter?



Make curls for a doll. Split the dandelion stems lengthwise into several sections part way up the stem. Moisten the stem by pulling it through your mouth. The stem should curl.



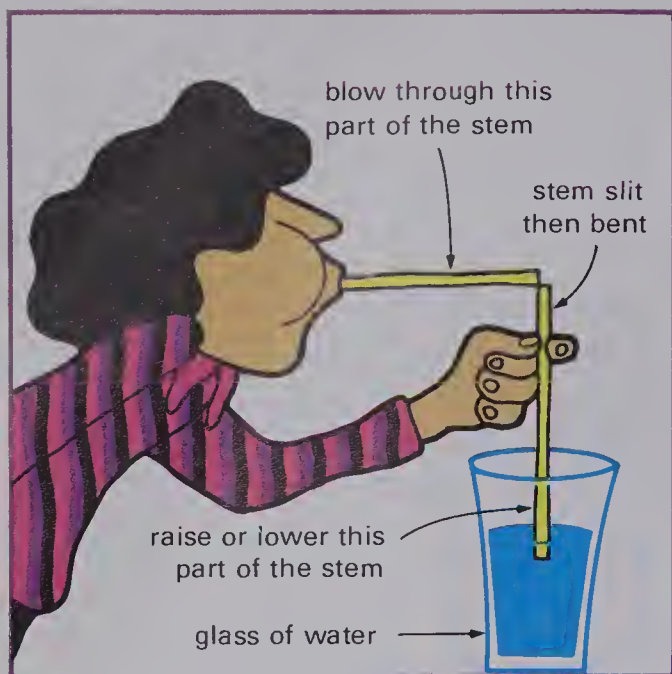
How many children will you have? Blow at a perfect dandelion seed-ball three times. The number of seeds remaining will provide the answer.

What time is it? The number of seeds remaining after three blows will indicate the hour. Test this activity to find out how often it is true.

Do you think that these activities are scientific?



How far can you snap dandelion flowers?



Activity 7:

How can sounds be made with dandelion stems?

Obtain a long, straight dandelion flower stem. Slit it with a sharp knife or razor blade so that it can be bent. Place one end of the stem in a glass of water. Raise and lower this end of the stem in the water while blowing through the other end of the stem.

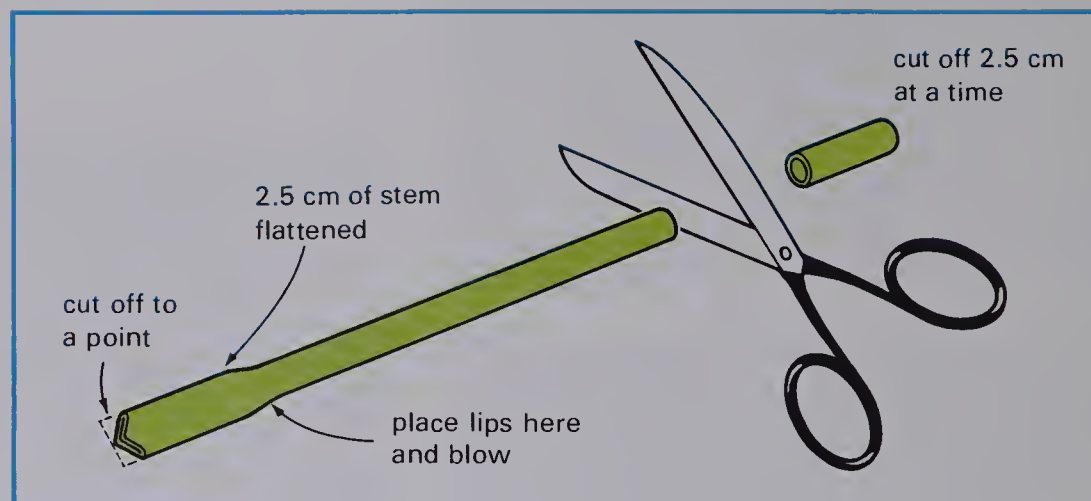
Flatten about 2.5 cm of the end of a dandelion stem. Cut the end of the flattened section to form a point. Blow through the stem with the flattened end in your mouth. Cut off the other end about 2.5 cm at a time as you blow. Both of these activities may require some practice before sounds can be easily made.

Digging Deeper

How did the sounds differ in these two activities?

How did the sounds change as the length of the stem was reduced?

What caused the sound in each activity?



Branching Out

Examine a number of wind instruments. Which produce sound by the vibration of the lips? Which produce sound by the vibration of a different reed? How is the size of the air column changed to produce different sounds?

Activity 8:

How can the dandelion puffball be preserved?

Here is a useful idea for those who are interested in obtaining a beautiful, long-lasting ingredient for a winter bouquet or similar arrangement. Pick the dandelion flowers and stems just after the blossoms close and before any white appears. Hang them straight upside down so that they can dry. The stems will dry in a stiff condition. In a few days, the heads will open into fluffy white puffs that can be easily displayed and yet the seeds will not be easily dispersed.

Make a simple attractive table decoration by inserting dandelion puffballs and other plant material into a piece of styrofoam.



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Glossary

Akene: Tiny one-seeded fruit produced by the dandelion.

Average: A good way to ensure greater accuracy. Add all the answers obtained and divide the total by the number of answers that were added. e.g. The average of 8, 10, and 12 is $\frac{30}{3}$, or 10.

Blanch: To whiten the leaves of dandelion plants by shielding them from sunlight.

Bract: A small leaf found at the base of a flower stalk.

Compaction: The degree of looseness of the soil.

Composite: Plants that form flowers in clusters in a head instead of single flowers.

Concave: A surface that curves in.

Convex: A surface that curves out.

Corolla: The whole group of petals of a flower.

Density: The number of plants in a particular area, e.g. the number of dandelions in a square metre of lawn.

Disk Flower: Floret with a tubular corolla, found in the centre of some composite flowers.

Dispersal: The spreading or scattering of seeds.

Ecologist: Scientist who studies ecology.

Ecology: The study of how plants and animals relate to each other and to the world around them.

Environment: All of the surroundings that affect a living thing.

Fibrous Root: Slender root with many branches as in the plantain.

Floret: One unit in the flower-head of a dandelion capable of producing one seed.

Flower Head: Flower parts that make up the entire composite flower.

Frequency: The percentage of an area in which a particular plant will be found growing.

Germination: Sprouting of seeds.

Horizontal: Flat, level, parallel to the horizon.

Humus: The black part of soil that is produced by the decay of leaves and other plant materials.

Involucral Bracts: Tiny leaf-like plant parts that surround a composite flower.

Immersion thermometer: A type of thermometer that can readily be used to measure the temperature of liquids.

Latex: Milky fluid found in certain plants such as milkweeds and dande-

lions. The juice can be made into rubber.

Maximum-minimum thermometer: A thermometer that measures the highest and lowest temperatures over an extended period of time.

Micro-climate (mini-climate): The weather and ecology of small areas — often extending only from about 1 m above the earth's surface to 25 cm beneath it.

Myth: A legend or story that tries to account for something in nature.

Pappus: Part of a seed that is made of a down-like material.

Pollen: Fine, yellowish powder made by the anther of a flower.

Quadrat: A clearly marked out area that is investigated.

Quadrat frame: A metal or wood frame to mark out an area being investigated.

Random sampling: Selecting samples in an unplanned way that leaves much to chance.

Ray flower: Floret with a strap-shaped corolla.

Sampling technique: A method of finding out about a population by studying only small parts of the population.

Splash pillar: A device that measures how high water is splashed from a surface by rain drops and how much soil is removed by the splashing effect of raindrops.

Standardize: Adjust the readings of a number of thermometers so that they are all alike.

Structure: The arrangement of the parts of a plant.

Succulent: Juicy.

Systematic sampling: A planned way of obtaining samples.

Taper: To gradually get narrower toward one end.

Tap root: A large main root as in the dandelion.

Transect: A line or belt through an area. The plants touching or covering it are recorded.

2,4-D: Chemical used to kill broad-leaved plants such as dandelions.

Variable: Something or a quality in an experiment that varies or changes.

Variation: The differences of structure or function between individuals of the same species.

Weed: A plant growing where we wish something else to grow.

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